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Hamilton Double Carriage Production Lathe

By J. V. HUNTER
Western Editor, *American Machinist*

The demand for high production naturally results in the development of new styles of machine tools. Each year sees more new designs placed upon the market as standard products, since the industry has advanced to the point where it will accept and can utilize them to advantage.

A LATHE equipped with two independent carriages has recently been placed on the market by the Hamilton Machine Co., Hamilton, Ohio. The object of the two carriages is to enable the turning and facing operations to be performed at the same time, the front carriage, shown best in Fig. 1, holding the turning tools, while the rear one, seen in Fig. 2, carries the facing tools.

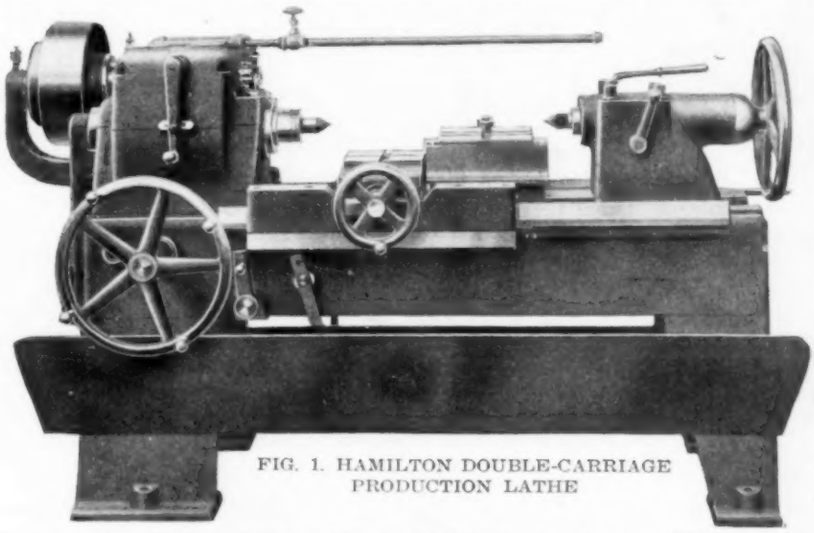


FIG. 1. HAMILTON DOUBLE-CARRIAGE PRODUCTION LATHE

The machine is intended for production work on such parts of steering knuckles for automobiles and tractors, small shafts, axle parts and gears of different types. It is stated that, when the lathe is properly tooled for a given job, it may be run by a comparatively unskilled operator and yet give speedy production and accurate work. The machine is quite simply, yet sturdily, constructed. The bed of the lathe is rather complicated, consisting practically of two narrow beds tied together by crossbraces at frequent intervals. Each of the beds bears a carriage and has two ways on its top surface. The front carriage runs on one V-way and one flat way, while both of the ways of the rear carriage are of the V-type, the inner one being smaller. The headstock and the tailstock are mounted on the two middle ways, the front one being flat and the back one a small V-way. The front carriage has a long bearing surface on its ways. It can be traversed by power, although the toolslide with which it is provided is hand-operated only, by means of the handwheel shown in Fig. 1. For ease in operation, the slide is equipped with a ball-bearing crossfeed screw and a large micrometer dial. The rear carriage can be traversed along the bed by hand and then clamped in position. The cross-slide is provided with a power feed, so that the turning and facing tools can be cutting at the same time. Both of the carriages and the toolslides are fitted with adjustable taper gibs.

The drive is through a constant-speed pulley mounted on the side of the headstock. If desired, silent chain drive can be furnished, the motor being mounted on the top of the headstock and the driving chain inclosed in a suitable guard. The spindle is driven from the drive shaft through inclosed wide-faced herringbone gears. It is made of chrome-nickel steel, runs in bronze bearings and has a large ball bearing to take up end thrust. In order to stop the spindle quickly after the clutch has been disengaged, an automatically operated brake with an asbestos lining is provided.

The same mechanism is used to feed both the front carriage and the rear toolslide. It is driven from the headstock spindle by an inclosed silent chain. The motion is transmitted through detachable change gears to an inclosed worm and a large worm-wheel to be seen on the rear of the bed in Fig. 2. The shaft of the worm-gear carries two pinions, which engage racks so as

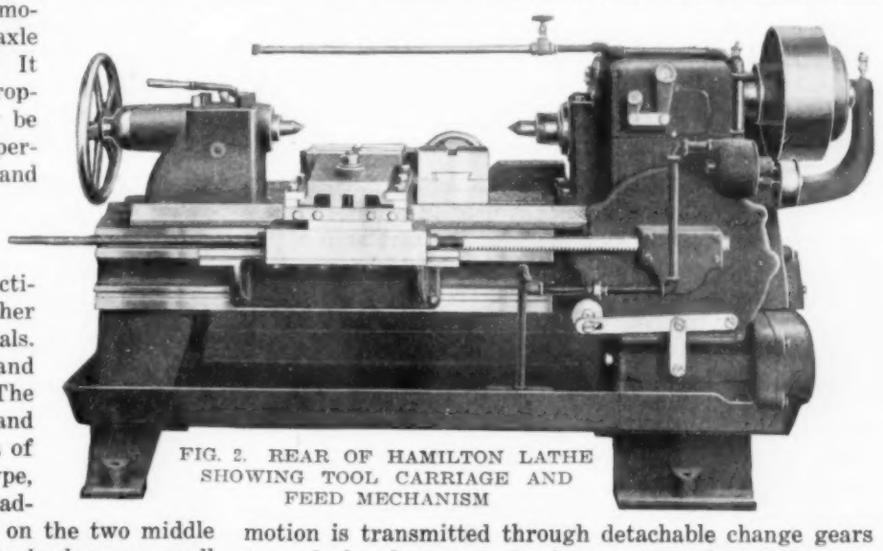


FIG. 2. REAR OF HAMILTON LATHE SHOWING TOOL CARRIAGE AND FEED MECHANISM

to transmit the feed motion to the front carriage and to the toolslide on the rear carriage.

Since the rack driving the facing tool can be seen in the illustration, it will be dealt with first. It is made in one piece with a long screw on which a flat, grooved cam

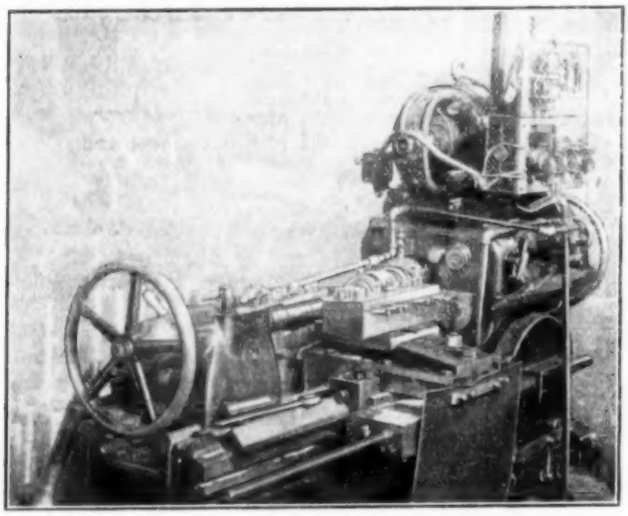


FIG. 3. THE LATHE, TOOLED UP FOR PRODUCTION WORK ON TRACTOR AXLES

is adjustably fastened. A roller fastened to the toolslide runs in the groove of the cam, so that a longitudinal motion of the rack produces a transverse movement of the toolslide. The cam slides on and is held in place by a bracket bolted to the rear of the bed on a finished surface provided with T-slots, so that the bracket can be shifted to correspond to the position of the carriage. The rear tool can be arranged to cut tapers, if desired.

The front carriage is moved longitudinally by the rack to which it is adjustably fastened inside the bed. It is fitted with a dog, the position of which can be adjusted to connect with a knock-out mechanism, and thus release the drive to the worm-gear when it is desired to stop the feed.

At the front of the machine under the headstock and on one side of the shaft of the worm-gear, is located a large handwheel by which both tools can be moved. This wheel not only provides a means of obtaining a quick return after finishing a cut, but also serves for setting the tools to the desired positions.

A Tooling Arrangement

Fig. 3 shows the lathe as set up for a shaft-turning job, the arrangement being that used in a large tractor plant for turning an axle shaft of the sort seen at the left. The heavy tool-holding blocks should be noted, as well as the arrangement of setscrews for adjusting independently the positions of the toolbits. It is stated that a total of 14 tools are cutting on this job at the same time, a feature that means rapid production. The view of the machine shows well the general construction of the rear carriage with the groove in the cam. The machine is equipped with an individual motor drive for this work.

A steel chip pan and coolant pump are regular equipment. The piping is arranged so that the flow of coolant can be adjusted to give a single stream or a number of small streams to cover the entire length of the work between the centers

A Method of Indexing Drawings

By M. Kurth

Chief Draftsman, Oil Well Supply Co.

In various branches of industry, particularly in those where a large variety of articles are manufactured, it is often difficult to follow general rules for establishing a system of indexing and filing records, and especially drawings to which reference must be made at a moment's notice.

In one of the largest manufacturing concerns of its kind, where thousands of articles are made which have no immediate relationship to each other, the following plan has been adopted, and during the past five years has proven entirely adequate to the purpose and superior to methods previously employed.

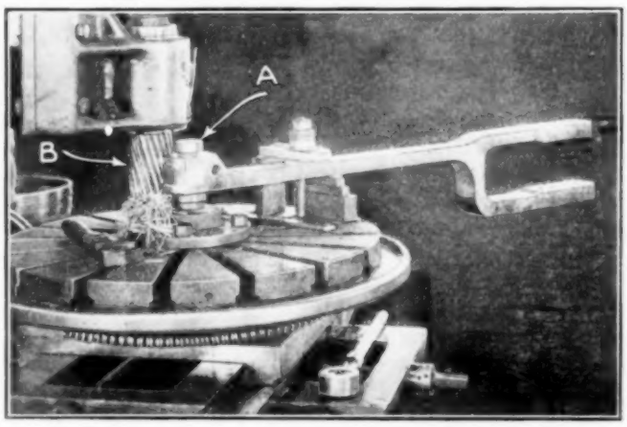
A large general catalog, in which is described and illustrated every article manufactured by the company, is made the key to the filing system, which operates in the following manner: The catalog is subdivided into a number of sections, each comprising about two hundred pages. The corresponding index card drawers bear the marking, page 1 to 200, 200 to 400, etc., and the filing of the cards is done in exactly the same order as the article appears listed in the catalog. Each index card bears the description and an outline of the article conforming with nomenclature and cut in the catalog which makes identification almost positive. The drawings themselves are also marked, referring to the catalog number as well as the page number on which the article appears, and they are filed in numerical order irrespective of size. Whenever new machinery is developed, entries are made in the catalog in that section where these parts will be permanently recorded later on in subsequent editions.

Milling the Radius on the End of a Rod

By E. A. Thanton

A method of milling the radius on the end of a rod is shown in the illustration. This scheme may be used for work on link rods, certain kinds of connecting rods or any similar work. A flanged center-pin is bolted to the revolving table of a vertical milling machine as shown at *A*. A spiral milling cutter is used as at *B*.

On heavy work, it is necessary to clamp the piece securely to the table and use the circular table feed. On light work it is sometimes possible to pull the rod around by hand. In the latter case the work can be done on any vertical milling machine.



MILLING THE RADIUS ON THE END OF A ROD

Some Experiences in Deep-hole Drilling

By CHARLES J. STARR
Planning Engineer, The New Britain Machine Co.

The drilling of deep holes presents problems not met in ordinary drilling work. This article was written by a man who has had practical experience in this line; and the points treated should prove of value in shops where deep-hole drilling is encountered, the drill which was found by the author to be the most satisfactory being fully described.

WHY is it that so many reference books on subjects of vital importance fail to give to the searching reader the exact bit of knowledge that he is looking for? This may not be in harmony with the title of this article, but nevertheless it is the thought which has prompted its writing.

Some time ago the writer had quite a varied experience in the drilling of long holes, and the problems encountered caused him to search, but with little success, through various books and papers for some hint that would help him at a time when he thought that he was up against it and when any suggestion was gladly considered. Looking back over those days, it seems only fair to pass on to the other fellow my experience, with the hope that he may find a few pointers that may be of use to him.

It seems to be an accepted fact that, no matter to whom you talk on this subject, when you commence to speak about the fine points of deep-hole drilling and the why and how of a single-lipped drill, the one of whom you ask questions will shut up like a clam and practically refuse to give you any information. I have talked with a number of men who are working continually along this line, yet I have met only one man who would impart any information whatsoever. This man was only too glad to tell anything that he knew, and to him I am greatly indebted for the success I have had with single-lipped drills.

An Unsatisfactory Drill

When I came in contact with this particular problem, forged steel spindles of 0.35 to 0.50 per cent carbon were being drilled with more or less success on a well-known make of deep-hole drilling machine on which the work revolved and the drill fed horizontally. The drill used was of the single-lipped type and furnished by the manufacturer of the machine. The single flute was helical instead of straight, and the cutting edge had several steps for breaking up the chips. It is not concerning this drill that I wish to speak, except to say that after numerous trials it was found wanting and our attention was turned to other types in an endeavor to find a solution for our problems.

Of deep-hole drills there are numerous designs, but they resolve themselves into practically two classes; namely, single- and double-lipped drills. Of course, it is well known that the two-lipped drill is superior to the single-lipped when speed is desired and not accuracy of diameter, and that is one of the things which we ascertained for ourselves on this job. The problem originally was to get a hole through the spindle, and it was considered that a single-lipped drill was the correct tool to use. After sufficient experimentation the hole was drilled with a two-lipped drill and then reamed, that process taking about one-third of the time required when working with a single-lipped drill.

Experimentation with Drills

The steps taken in testing different drills are worthy of investigation. The type of drill shown in Fig. 1 was decided on and tried out with considerable success until the carbon content of the spindle was increased from the 0.35—0.50 range to 0.75—0.80. With high-carbon steel, forged and annealed, it was found that the drill with the inserted blade failed to live up to what was expected of it, and so a new design of drill was sought for, which resulted in using the solid single-lipped drill shown in Fig. 2.

It is the design of this drill that I wish to speak of, in order to compare it with others and to endeavor to show why it seems to me much simpler and easier to make, and also why, if made and sharpened correctly, it will live up to what is expected of it.

On high-carbon steel, the drill shown in Fig. 1 seemed to fail because of lack of support at the cutting point. By lack of support I mean support in two ways: First, in order that the drill will clear itself, the cutting edge must create a greater diameter than the size of the drill body, consequently the body could

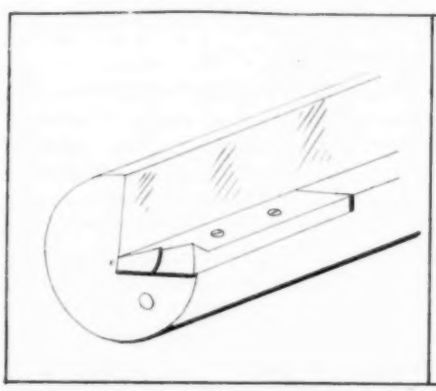


FIG. 1. INSERTED-BLADE, SINGLE-LIPPED, STRAIGHT-FLUTED DRILL

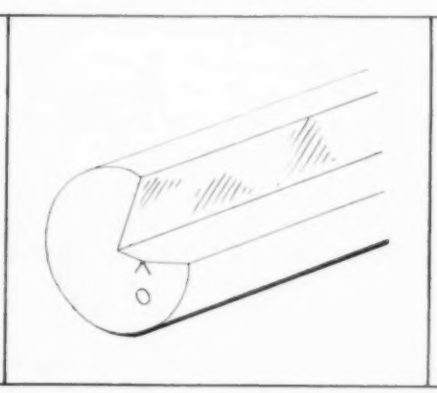


FIG. 2. SOLID, SINGLE-LIPPED, STRAIGHT-FLUTED DRILL

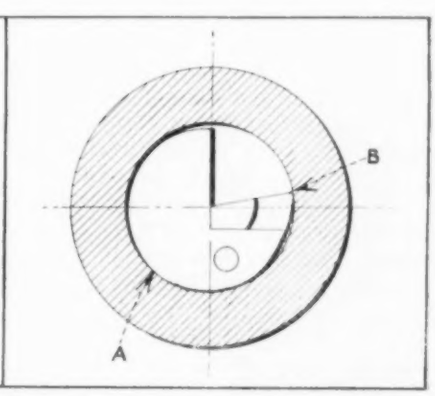


FIG. 3. CLEARANCE OF THE INSERTED-BLADE DRILL

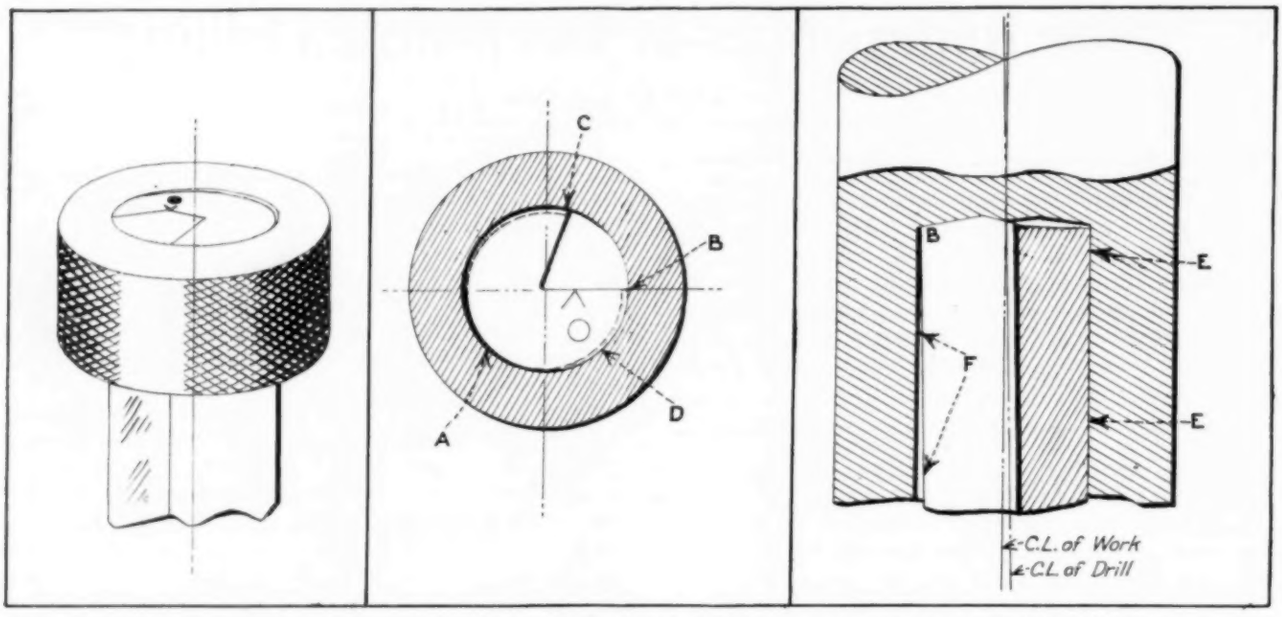


FIG. 4. USE OF THE RING-GAGE ON THE SOLID-END DRILL

FIG. 5. CLEARANCE ACTION OF THE 70-DEG. FLUTE DRILL

FIG. 6. BENDING OF DRILL SHANK

bear on the hole in only two places, as shown at *A* and *B* in Fig. 3; and second, in order to make regrinding of the inserted blade possible it was made to project ahead of the drill body, which resulted in making it weaker and more liable to snap off.

With the solid drill, shown in Fig. 2, the conditions might be considered as being similar as to clearance and bearing points, except that they are not as exaggerated as with the inserted blade. The form of the cutting edge can be governed when sharpening, and after the correct formation is found it can be kept at each succeeding grinding till the drill is completely worn out. As to the clearance of the drill in the hole, that is, having the drill cut large enough to free itself, that may be governed in two ways, first, by giving the drill a back taper through its entire length of about one-thousandth inch per inch of length, and second, by the relative length and degree of angle of the two flats comprising the cutting edge.

Cutting Edge of the Solid Drill

When we first started using these drills the points were ground by hand and the amount of clearance determined by the use of a 6-in. scale and a ring gage of the correct diameter to fit the end of the drill. This gage was used to show the relative position of the several parts on the periphery with relation to the point of the cutting edge which is on the periphery and which determines the bore of the hole. See Fig. 4. By trying the point in this way it could be easily seen whether or not the several parts on the periphery were behind the cutting point and how much.

At first the flute of the drill was cut with a straight milling cutter, thus making it 90 deg.; but later on it was found advisable to cut this down to 70 deg. The reason for this was that it was found that the point *C*, in Fig. 5, opposite point *B* was inclined to bear on the hole and help steady point *B*. This action was found to vary when the lengths of the flats of the cutting edge varied from what was later found to be proper, and also, when the clearance angle below the cutting lip varied. It was found that the variations of these quantities governed the size of the hole. If the drill cut too large, it was found that *A* had moved toward *B*; and not being properly supported at *C*, the drill would chatter, this chatter causing the keen cutting edge at point *B* to break down so that the drill must be resharpened.

If the drill cut too small, because of the improper proportioning of the two angles of the cutting edge, then undue wear would be noticed at point *C*, and also, wear could be seen over quite an area at *A*, and sometimes clear around the periphery. After sharpening the drill, it was always coated with copper sulphate before using it again in the hole, for only by doing this were we able to tell where the bearing came and what was the action of the drill.

The question will doubtless arise concerning clearance around the periphery, as at *D* in Fig. 5. It was found that the axis of the drill did not follow the axis of the work but was inclined at a slight angle to it, due to the pressure of the feed springing the drill shank and causing it to bear against the side of the hole, as shown at *E* in Fig. 6. The result was that the taper of the drill for its entire length came all on one side, as at *F*, giving the necessary clearance behind the point *B*. Referring again to Fig. 5, a good idea of the three bearing points on the periphery can be obtained, *B* and *C* being on the end of the drill and *A* extending up the shank from the bottom.

Design of Flute

The question arose as to the design of the flute, that is, the width of the opening and also the advisability of using the straight or spiral flute. The width of opening has been spoken of before, and some reasons for changing it from 90 deg. to less have been given. Furthermore, it was found that by making the flute narrower, the chip was not allowed to curl up as much and choke the drill, particularly when cutting soft stock. The spiral flute was tried out with the idea in view of giving a shearing cut, but it was found that the point was not properly supported under these conditions and would wear away rapidly. This wearing away process was found to take place practically in a straight line, parallel with the axis of the drill. Noting that, we

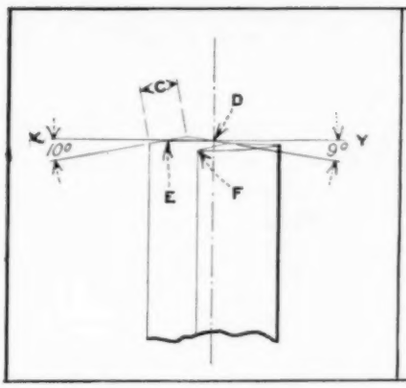


FIG. 7. PROFILE OF END OF SINGLE-LIPPED DRILL

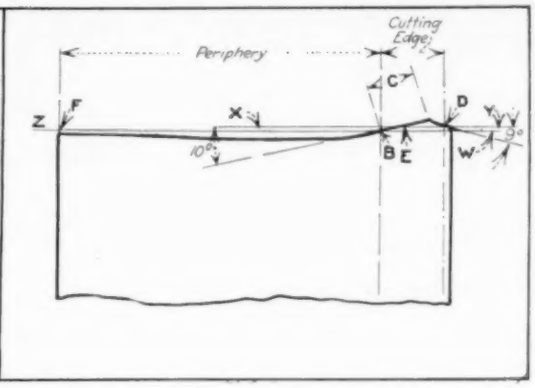


FIG. 8. DEVELOPED PROFILE OF SINGLE-LIPPED DRILL

ground the flute out straight for a short distance back and found under this new condition that the point stood up very well. Another point in favor of the straight flute was that, when necessary, the cutting face in the flute could be reground to give a sharp edge the entire length of the flute.

The Cutting Edge

The proper proportion of the two cutting edges comprising the lip was found to be about the same regardless of the drill diameter; that is, the length of the outer edge should be one-third of the diameter of the drill, as shown at *C* in Fig. 7. Then, too, the angles must be in such a relation to each other that if a scale, as through line *XY*, were laid across, starting from the center *D* and held at right angles with the center line of the drill, it would cut the lip *C* into two equal parts at *E*. This proportion was found to hold true on all sizes of drills from $\frac{3}{4}$-in. up to 3-in. diameter.

The form of the end of the drill around its periphery cannot be too strongly emphasized, for this was found to influence the cutting action and also to help in governing the size of the hole. The development of the point of the single-lipped drill is shown in Fig. 8, the letters corresponding to those in Fig. 7. The proportions as here shown are adaptable to almost all sizes of drills, these being taken from a $1\frac{1}{2}$-in. drill. Line *Z-W* denotes the circumference of the bottom of the hole as cut by point *B*, the developed periphery of the drill out to point *F* lying behind it.

One other point which must be considered in the sharpening of this type of drill is the clearance under the cutting lips, both inner and outer. The outer lip, being wider and exerting a greater pressure, tends to make the drill cut small; therefore, the clearance under the cutting edge must be large, so as to allow the edge to cut freely. The inner lip, being narrower, must have a blunter cutting edge to offset the pressure of the outer lip and make the drill cut large enough to free itself.

Doubtless the foregoing explanation is such as to cause anyone to consider this drill as a rather difficult proposition to grind and keep in proper condition, but on the contrary it was found by the writer to be quite easily cared for. With the use of the proper grinding machine and correctly formed cams for sharpening, a good drill point could be assured at all times.

As to speeds and feeds to be used, these were found to vary according to the diameter of the drill and hardness of the metal. Spindles of 0.60 per cent carbon steel, forged and properly annealed, have been drilled with a 1-in. diameter drill at the rate of 30 in. an hour; also, chrome-nickel steel spindles, forged and properly heat-treated, were drilled with a $1\frac{1}{2}$-in. drill at the rate of 22 in. an hour. The standard adopted for drilling for all sizes was a surface speed of 100 ft. per min. and all the feed that the drill would stand, though it was found that a very light feed gave the most satisfactory results. In the case of the $1\frac{1}{2}$-in. diameter drill, we ran that at a speed of 295 r.p.m., which equaled 117.5 ft. per min., with a feed of 0.00125 in. per revolution. Because of the closeness of the points of support in this drill it is believed that it can be run at a high surface speed with more safety than drills with excessive relief ground on them, and also, that it is far superior to the inserted-blade type.

The writer has seen deep hole drills of such design as to make it necessary to tool up quite elaborately in order to grind the relief. For one drill a master cam was milled with a drop on its circumference of from 0.005 to 0.025 in., according to the diameter of the drill. By using these cams when grinding, a three point bearing was produced on the periphery of the drill, with the idea of steadying the cutting edge. This I consider unnecessary, as I have already shown when treating of the design of the drill shown in Fig. 2. The form of the point, coupled with the taper on the drill, will give ample clearance to the cutting edge and distribute the wear more evenly over the circumference of the drill.

Single- and Double-Lipped Drills

Of course, we all know that a two-lipped drill will cut much faster, but the size of the bore will not be held as accurately as with the single-lipped drill. The reasons for all this are well known and need no further reference.

The whole of my experience with deep hole drilling has been with drills ranging from $\frac{3}{4}$ to $3\frac{1}{2}$ in. in diameter, yet I believe that this drill is applicable to sizes below $\frac{3}{4}$ in. As to the larger sizes, I will say that the drill works correctly, yet from the standpoint of production it is not practical. For large sizes the two-lipped drill is the best; but with the smaller sizes, due to the consequent lightness and frailty of the cutting tool, the single-lip is by far superior.

The foregoing information I believe to be of greatest

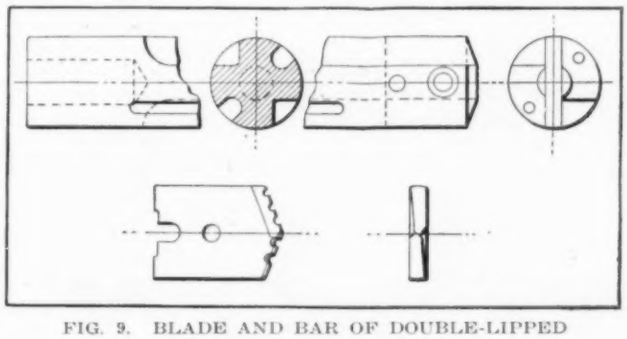


FIG. 9. BLADE AND BAR OF DOUBLE-LIPPED STRAIGHT-FLUTED DRILL

value to those who drill small holes, ¾ in. in diameter and under, as in rifles and shot guns, and for these sizes I believe this drill to be very satisfactory. On larger sizes, that is, 1 in. in diameter and over, I believe that this drill, or any other single-lipped drill, can be beaten by the two-lipped drill, finish of course not considered.

A Fast Two-Lipped Drill

I have seen some pretty good time made when drilling deep holes with a two-lipped drill. In this case, a drill of the type illustrated in Fig. 9 was used. The flutes of the drill are straight, and the inserted blade has broken cutting edges.

Cost Keeping in the Small Shop

By T. P. Schustek

The article by Mr. Colvin in the Sept. 2 issue of *American Machinist*, entitled "Cost Keeping in the Small Shop," is very interesting and prompted the writer, who designed the system described below and which is in successful operation in the shop of the S. A. Rhodes Manufacturing Co., Chicago, to offer his ideas to readers of the *American Machinist*.

TICKET NO. 1448 DATE Sept 10

7 8 9 10 11 12 1 2 3 4 5 6 7

NAME Albert Jones ORDER NO. 6745

HOURS OVERTIME TOTAL HOURS 8½

CHECK MARK	OPERATION	NO. PCS.	CHECK MARK	OPERATION	NO. PCS.	CHECK MARK	OPERATION	NO. PCS.
✓	LATHE	4		BENCH WORK				
	MILLING			POLISHING				
	SHAPER			PAINTING				
	PUNCH PRESS			FORGE AND HARD				
	DRILL PRESS			ENGRAVING				
	GRINDING			BOX AND PACKING				

FIG. 3. TIME CARD

This system has worked out satisfactorily in every respect, enabling us to keep quite accurate costs on all jobs, the necessary precautions, of course, being taken to see that all material used is properly listed and the time cards properly filled out. This being done, we have found no place where the system is not perfect for a small shop with one girl to do the bookkeeping, cost-keeping, correspondence, etc.

In addition to keeping accurate costs, we have the advantage of knowing, by 9 o'clock each morning, just how many hours and how much money in time have been put on every job up to the night before, this point alone being particularly valuable, inasmuch as the office always knows just what has been done in the shop.

Our girl makes out our orders in duplicate, one for the shop, Fig. 1, printed on blue paper, and one for the office, Fig. 2, both on 6 x 9½-in. forms to fit a standard binder, space being provided for any special instructions that may be necessary. The material used is listed on the shop order and when the job is completed the shop order is turned into the office and the material transferred to the office copy and priced.

The sample copy should explain itself. If the job consumes more time than the office form provides for, we simply use a second sheet. On the shop copy, if the material list is a long one, we list it on the back.

Our time cards, Fig. 3, are all numbered consecutively, starting from No. 1 on Jan. 1 of each year and are filed numerically. The man working on the job simply draws a line on the scale along the top of the card (which indicates the time of day) at the time he starts and finishes the job, and fills in his name, date, order number and operation. He does not have to figure up the number of hours on each job.

A new card is taken each morning and for each different job.

SHOP ORDER No. 6745 DATE Sept. 8 '20

FOR Geneva Order # P248 DATE PROMISED Oct. 15 SURE

75 Disk holders as per B. P. # G 243

Be sure to hold the 1.125 in. dimension to size.

The tolerance is plus or minus 0.0015 in. although not shown on B. P.

LBS. OR NOS.	DESCRIPTION OF MATERIAL	DATE	NO. FIN.	DATE	NO. FIN.
67½	Brass Castings	9-10	4		
3¼	Brass Rod 5/8 dia.	9-11	4		
		9-13	4		
		9-14	12		
		9-15	16		
		9-16	20		
		9-17	15		
			75		

FIG. 1. SHOP ORDER

ORDER No. 6745 DATE Sept. 8 '20

FOR Geneva Order # P 248 DATE PROMISED Oct. 15 SURE

75 Disk holders as per B. P. # G 243

Be sure to hold the 1.125 in. dimension to size. The tolerance is plus or minus 0.0015 in. although not shown on B. P.

LBS. OR NOS.	DESCRIPTION OF MATERIAL	@		
67½	Brass Castings	32	21	60
3¼	5/8 ϕ Brass Rod.	29½		96
			22	56
	TOTAL MATERIAL			
	NO. OF HOURS 74¼ TIME		58	34
	TIME AND MATERIAL		80	90
	OVERHEAD FIGURED @ 85 %		49	59
	COST EACH $1.74 TOTAL COST		130	49

TICKET NO.	DATE	HRS.	RATE	AMOUNT	TOTAL HRS.	TOTAL AMOUNT
1448	9-10	8½	75	6 38		
1451	9-11	9½	75	5 63	16	12 01
1452	9-13	6	75	4 50	22	16 51
1454	9-14	4	85	3 40	26	19 91
1455	9-14	5¼	75	3 94	31¼	23 85
1460	9-15	5¼	85	4 46	36½	28 31
1461	9-15	8½	75	6 38	45	34 69
1462	9-16	8½	85	7 23	53½	41 92
1463	9-16	8½	75	6 38	62	48 30
1470	9-17	8½	85	7 23	70½	55 53
1471	9-17	3¼	75	2 81	74¼	58 34

FIG. 2. OFFICE ORDER

The man who always retains his head can usually retain a goodly share of other things.—*Forbes Magazine*.

Acceleration Determinations—II

By HENRY N. BONIS, B. S., M. E.
Assistant Professor of Mechanical Engineering, Purdue University

In the author's previous article on this subject he made use of several theorems and constructions which were assumed to be correct. Here he gives proofs of these constructions and goes on to other short cuts without using higher mathematics.

(Part I appeared in the last issue.)

IN PART I of this article, which appeared last week, the writer evolved means for the solution of the quadric chain when a sliding joint was one of the elements. In so doing reference was made to $\mu\omega$, the acceleration of the instantaneous center, and to Bobillier's Construction for finding the tangent to the centrode at the instantaneous center. The writer will endeavor in the following lines to give simple proofs and demonstrations of the above references together

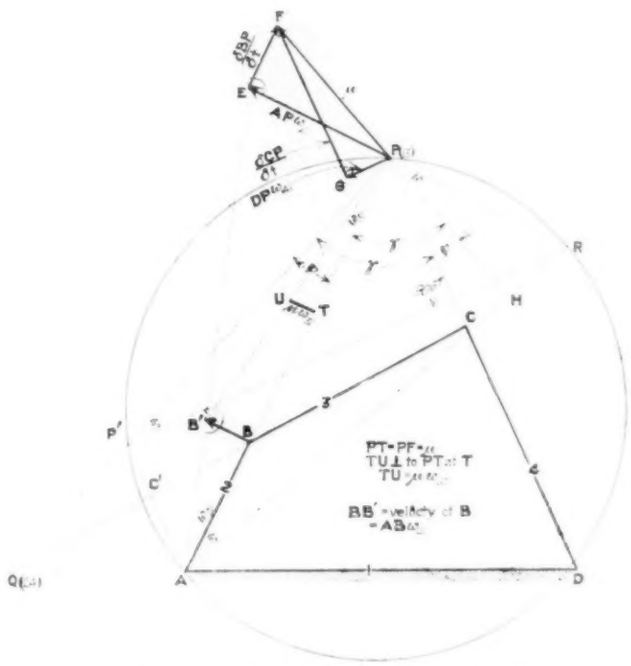


FIG. 1. DIAGRAM OF QUADRIC CHAIN

with a few other theorems which the machine designer or student of kinematics will be able to understand and use without resorting to higher mathematics.

Before proceeding with the above proofs I will develop a construction whereby the angular acceleration of the coupler can be determined when the acceleration of any point of the driver is known. The proofs already mentioned will follow very simply.

Referring to Fig. 1, we have the quadric chain $ABCD$. Locate the instantaneous centers $P(13)$ and $Q(24)$ by prolonging the sides 2 and 4 and 1 and 3 respectively. Now we have

$$\frac{\omega_{21}}{\omega_{21}} = \frac{23 - 21}{23 - 31} = -\frac{BA}{BP}$$

Differentiation will give

$$\frac{\omega_{21} A_{31} - \omega_{21} A_{21}}{\omega_{21}^2} = \frac{BA}{BP^2} \cdot \frac{\delta BP}{\delta t} \quad \text{where } A = \frac{\delta \omega}{\delta t}$$

$\frac{\delta BA}{\delta t} = O$, since BA is constant.

In order to determine $\frac{\delta BP}{\delta t}$ we proceed to find the velocity of the point of intersection P of both lines AP and DP about their fixed centers A and D respectively. Point P as a point on link 2 has a velocity $PE = AP\omega_{21}$ which is normal to AP, and a sliding component $EF = \frac{\delta BP}{\delta t}$ parallel to AP. Similarly point P as a point on link 4 has a velocity $PG = DP\omega_{41}$ which is normal to DP, and a sliding component $GF = \frac{\delta CP}{\delta t}$ which is parallel to CP. We thus determine the velocity $PF = \mu$ of the point of intersection P, which is the velocity of the instantaneous center (13). Join P with Q and draw $AC'P'$ parallel to link 4. Draw $P'R$ and PR perpendicular to AP' and AP respectively and join A with R.

Now triangles $AP'R$ and PGF and APR and PEF are respectively similar, and the ratio of proportionality of the sides is ω_{21} to 1, which is evident since $PE = AP\omega_{21}$. Or by Professor Rosebrugh's phorograph $AP'\omega_{21} = DP\omega_{41} = PG$, and hence $\frac{\delta BP}{\delta t} = PR\omega_{21}$.

Let angle $PAR = \varepsilon$ and angle $QPD = \gamma$. Now since the right-angled triangles $AP'R$ and APR have the same hypothenuse AR we can pass a circle through the points A, P', P and R on AR as a diameter and we see that angle $PAR = \varepsilon = PP'R = 90° - \gamma$. Prolong PF to intersect AR at H. Then we have

$$\text{angle } HPC = \psi = HPA - CPA = \gamma - CPA$$

$$\text{also angle } QPA = \psi = QPD - CPA = \gamma - CPA$$

Hence $HPC = QPA$, and since HP is the direction of velocity μ of the instantaneous center $P(13)$ we have the proof of construction for Bobillier's Construction.

Now we have $PR = PA \tan \varepsilon = PA \cot \gamma$, and substituting $\frac{\delta BP}{\delta t} = PR\omega_{21} = PA\omega_{21} \cot \gamma$ in our original equation we get

$$\frac{A_{31}}{\omega_{21}} - \omega_{21} \frac{A_{21}}{\omega_{21}^2} = \frac{BA}{BP^2} PA\omega_{21} \cot \gamma$$

$$A_{31} = \frac{BA}{BP^2} PA\omega_{21}^2 \cot \gamma + \omega_{21}\omega_{21} A \frac{A_{21}}{\omega_{21}^2}$$

Dividing by ω_{21}^2 we get, after substituting $\frac{\omega_{21}}{\omega_{21}} = -\frac{BA}{BP}$,

$$\frac{A_{31}}{\omega_{21}^2} = \frac{AP \cot \gamma - BP \frac{A_{21}}{\omega_{21}^2}}{BA} \qquad (1)$$

Let $\frac{A_{21}}{\omega_{21}^2} = \tan X$ and $\frac{A_{21}}{\omega_{21}^2} = \tan G$, where X and G are the angles made by the relative acceleration vectors with the line joining any two points on links 3 and 2 respectively. Equation 1 permits a similar graphical construction to the one shown in the previous article and may perhaps afford in certain cases a shorter one.

In order to take care of the signs of the various quantities entering I have formulated the following procedure. (See Fig. 2.) Draw perpendiculars to AP

at A and P respectively. Prolong MB, the acceleration vector of B, to intersect the perpendicular at P (say at E). Consider angle γ as generated by turning PQ to PD and lay off angle FEH at E in the same direction from the perpendicular at P and equal to γ. Prolong HE to intersect the perpendicular at A (say J). Join J and B and prolong indefinitely to K. Then angle $KBP = X$ when $MBA = G$. Taking P as a center the direction of BK (since angle PBK cannot be greater than 90 deg.) will show the direction of the angular acceleration of link 3. Also since the relative

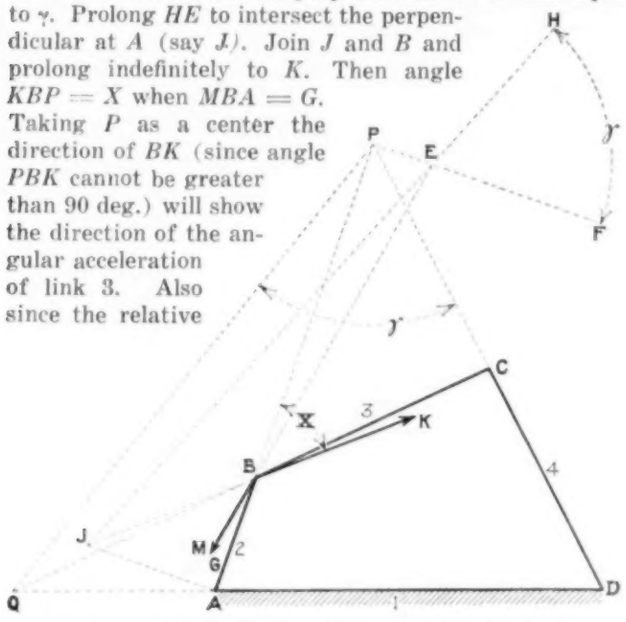


FIG. 2. DIRECTION OF ROTATION DIAGRAM FOR DETERMINING SIGNS

centripetal acceleration of C about B can be easily determined, i.e., $BC\omega^2_{34}$, the tangential acceleration of C relative to B is obtained from the ratio given by tan X, and hence the total acceleration of C can be obtained directly by the addition of the two vectors representing the absolute acceleration of B and the relative acceleration of C to B.

Meaning of the Angle X

A little consideration of the meaning of the angle X will afford a simple means of determining the center of acceleration when we are given the accelerations of any two points of a plane figure, or when the directions and the ratio of the accelerations are given. It also furnishes simple proof of the acceleration image.

Referring to Fig. 3 we are given the acceleration of P and G completely, and if we can find a point H whose relative acceleration is opposite in direction but equal in magnitude respectively to the absolute acceleration of P or G we have determined a point whose absolute acceleration is zero, and hence the point found will be the center of acceleration. Let PA and GB be the accelerations of points P and G respectively. Draw BC equal and opposite to PA. Then GC is the relative acceleration of point G to P. Join P and C. Lay off $CD = BC = PA$. Draw DE parallel to PC. With P as a center and the radius PE draw the circle EH. Make angle APH equal to the angle CGP. Also make angle HGB equal to angle CGP. Then the lines HP and HG and the circle HE all intersect at H, the center of acceleration. For the actual determination of H any two of these three loci could be used. A fourth locus could be obtained by passing a circle through G, P and the intersection of GB and PA. (See two-circle method—Klein's "Kinematics of Machinery," page 121, or Introduction—Weisbach-Hermann, "Mechanics of Engineering and Machinery," page 44—art. 21.)

Since GC is the relative acceleration of G to P, the relative acceleration of any point on the line PG, such as E, would bear to the relative acceleration of G the ratio of PE to PG, and hence EF drawn parallel to GC and limited by the line PC is the relative acceleration of E to P. The magnitude of EF is determined graphically by means of the similar triangles PEF and PGC. The angles PEF and PGC are also equal. In fact the angle between the relative acceleration vector of any point K in the plane of lamina and the line joining K to P would also be equal to PEF or PGC. As regards the magnitude, any point on the circle HE would have the same magnitude of relative acceleration as point E, namely the length of EF.

Now taking the particular point H we have by construction $APH = PGC = PEF = PHM$. Hence the relative acceleration vector of point H is parallel and opposite to the absolute acceleration vector PA, and since the magnitudes of the relative accelerations to point P of points E and H are equal (because $PE = PH$), and since $HM = EF = DC = BC = AP$ by construction, the relative acceleration of H to P is equal and opposite to the absolute acceleration of point P, and therefore the absolute acceleration of point H is zero. We have thus determined the locus PH and the circle EH whose intersection gives us the center of acceleration. Had the point G been used as a point of reference we would have found the other locus GH and another circle with G as center and radius GH that would have intersected also at H. But since we know that all the angles marked X are equal we arrive at a very simple construction, because all we need to do is to find the value of X, which is given at once at G by the angle PGC, and draw lines HG and HP making the angle X with the absolute acceleration vectors PA and GB.

Although this method gives a construction some of the lines of which coincide with the method of images, the writer believes the statement of procedure to be new and shorter, and likewise the proof. The method described above of using one line and a circle gives a new construction. Inasmuch as we need only know the value of X we need only be given the directions and the ratio of the magnitudes of

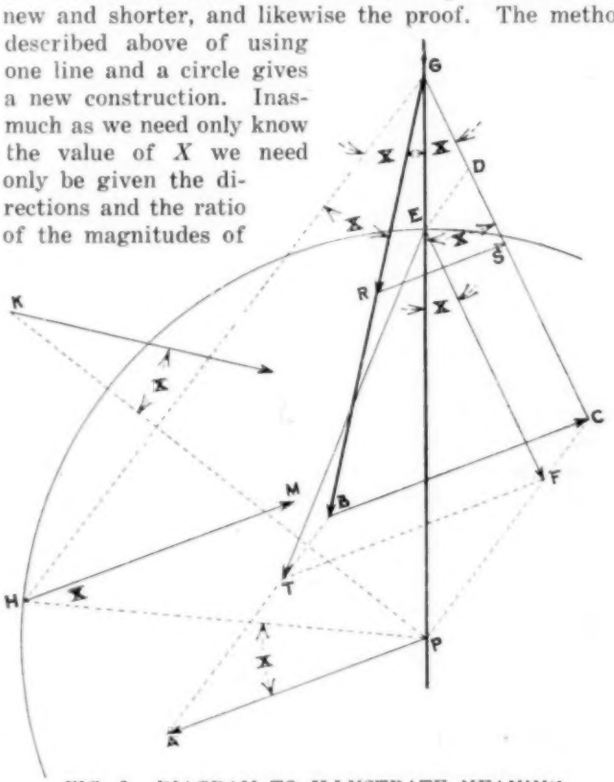


FIG. 3. DIAGRAM TO ILLUSTRATE MEANING OF ANGLE X

the accelerations of P and G. To determine X draw GR and RS to scale to represent the accelerations of G and P (reversed) and join G to S and we get $SGP = X$ as before. This construction is much simpler than the two-circle method.

In the two-circle method when one of the accelerations happens to lie along the line PG joining the two points we have a failing case. It is evident, however, that this case can be solved by a combination of the two-circle and the image method. But by using the relative acceleration method as above and obtaining the angle X we never have a failing case.

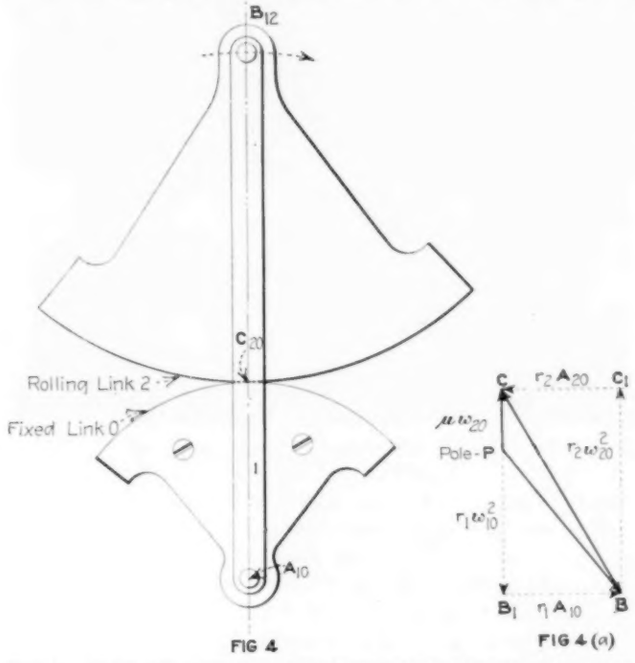


FIG. 4. BAR AND CIRCULAR LINK MECHANISM DIAGRAM

Again referring to Fig. 3. Join A and B and draw FT parallel to AP. Consider E as any point on line PG. Since EF is the relative acceleration of E to P, and FT is the absolute acceleration of P, we have ET as the absolute acceleration of point E. Since triangles PEF and PGC are similar we have $PF : PC = PE : PG$. But $AT = PF$ and $AB = PC$. Hence $AT : AB = PE : PG$, which proves the principle of the acceleration image.

The same reasoning as above gives us a simple proof of the principle of the velocity image.

If we apply our method of reasoning to determine the instantaneous center of velocity we will find that the angle X is 90 deg. (as it should be since the relative velocity of one point to another is always perpendicular to the line joining them) and we therefore have the rule of drawing normals to the directions of the two respective velocities. We could also find the instantaneous center of velocities by the two-circle method as a means of checking the accuracy of the drawing, but there are other simpler methods.

The theorems connected with rolling curves and usually applied to finding the velocity μ and acceleration $\mu\omega$ of the point of contact or instantaneous center can be very easily obtained by referring to Fig. 4, where we have two circular links 0 and 2 whose centers are connected by the bar link 1. Link 0 is fixed and link 1 is assumed as the driver with an angular velocity ω_{10} and angular acceleration A_{10}. Now as link 1 rotates with angular velocity ω_{10} the point of contact $C(20)$ will move along both curves with a velocity $\mu = r_0\omega_{10}$ where r_0 is the radius of link 0. We also have the following angular velocity ratio $\frac{\omega_{20}}{\omega_{10}} = \frac{12 - 10}{12 - 20} = \frac{r_2 + r_0}{r_2}$ where r_2 is the radius of link 2. Substituting the value of ω_{10} we have

$$\frac{\omega_{20}}{\mu} = \frac{r_2 + r_0}{r_2 r_0} = \frac{1}{r_0} + \frac{1}{r_2} \qquad (2)$$

It is to be noted that if the curvature of the circles were in the same direction one of the signs would have to be changed.

As regards the acceleration of point C on link 2, we have to add together the vectors representing the total acceleration of $B(12)$ and the relative acceleration of $C(20)$ to $B(12)$. Referring to Fig. 4(a) we have an acceleration diagram with P as pole. Draw $PB_1 = r_1\omega^2_{10}$ = centripetal acceleration of B to A. Draw $B_1B = r_1A_{10}$ = tangential acceleration of B to A. (r_1 = length of link 1 = $r_2 + r_0$.) Then we have PB as the total acceleration of B. Draw $BC_1 = r_2\omega^2_{20}$ = centripetal acceleration of $C(20)$ to $B(12)$, and $C_1C = r_2A_{20}$ = tangential acceleration of $C(20)$ to $B(12)$. Then BC is the relative acceleration of C to B, and hence PC is the total acceleration of $C(20)$. It will be noted that in the figure $B_1B = CC_1$. Since we have above the ratio of angular velocities $\frac{\omega_{20}}{\omega_{10}} = \frac{r_2 + r_0}{r_2} = \frac{r_1}{r_2}$ = a constant, the ratio of the angular accelerations is also equal to this same constant, and hence

$$\frac{A_{20}}{A_{10}} = \frac{r_2 + r_0}{r_2} = \frac{r_1}{r_2} \text{ or, } r_2A_{20} = r_1A_{10}.$$

The total acceleration PC of the instantaneous center is therefore only along the normal, the tangential component having just been shown to be zero. The magnitude of PC is the difference of the two centripetal accelerations BC_1 and PB_1, that is, $PC = r_2\omega^2_{20} - r_1\omega^2_{10} = r_2\omega^2_{20}\left[1 - \frac{r_1}{r_2}\left(\frac{\omega_{10}}{\omega_{20}}\right)^2\right]$.

Substituting the value $\frac{\omega_{10}}{\omega_{20}} = \frac{r_2}{r_1}$ we get $PC = r_2\omega^2_{20}\left(1 - \frac{r_2}{r_1}\right)$ or $PC = \frac{r_2r_0}{r_1}\omega^2_{20}$. But from equation 2, $\mu = \frac{r_2r_0}{r_1}\omega_{20}$, and therefore $PC = \mu\omega_{20}$. (3)

We have derived equations 2 and 3 from the consideration of circular arcs. But no generality is lost, for if for the instant two rolling plane curves are placed in tangency at point C equations 2 and 3 may be extended to cover these curves, provided the circles used are the osculating circles and A and B therefore the centers of curvature of the rolling curves.

Errata

Two typographical errors occurred in the article, "Strengths of Shafts and Beams," by John S. Watts in the issue of Nov. 11.

At the top of the second column on page 910 the total stress should have been $\frac{f}{2} + \sqrt{f_r^2 + \frac{1}{4}f^2}$, and below the center of the same column the latter part of the formula for calculating the shaft diameter should have been $D = \sqrt[3]{\frac{T_1}{0.196 \times f}}$.

We are indebted to Frank W. Salmon, Richmond, Va., for calling our attention to the errors.

Building Saw Mill Machinery

By FRED H. COLVIN
Editor, *American Machinist*

The past five years have shown great increases and improvements in the machine-tool equipment of some of the better plants in the Pacific Coast States. These improvements have meant more modern methods and better production in every way. Some of the results are shown herewith.

AMONG the shops in Portland, Oregon, the plant of the Willamette Iron Works stands out in many ways. Two of the prominent features are the large number of logging outfits which it has installed in various sections of the West and Northwest, and also its record as a builder of marine boilers during the war. Leaving the latter, for another article, this article will show some of the methods which have been developed for the more economical production of saw mill engines and other machinery. It will also be noted that the machine equipment contains many modern tools and of a size which are not common in this section of the country.

Steam engines for saw mills were formerly about as crude as could be built, the question of fuel economy not being a factor owing to the large amount of waste lumber which could be used for firing the boiler. This condition, however, no longer exists as the power now required to run saw mill engines is so large, that slabs and trimmings cannot be fired fast enough to maintain the desired steam pressure.

When it becomes necessary, as is now the case, to burn perfectly good timber to produce steam, saw mill engines with a low steam consumption are in demand and the engine of today is much more refined in every way, than that of the past. The fuel has become such a problem in some sections that oil engines are being installed in place of steam.

The machining of the steam cylinder of one of the more modern saw mill engines is shown in Fig. 1, a four-headed Ingersoll milling machine being used for this purpose. The method of mounting the cylinder, which has first been bored, can be clearly seen. The supporting mandrel *A* carries spools *B*, centering the cylinder and holding it in the V-block shown. The thrust of the left-hand vertical cutter head is taken by the substantial jack *C*. It will also be noted that the right-hand head on the cross-rail can be swung into any desired position, making it particularly useful for angular work of any kind.

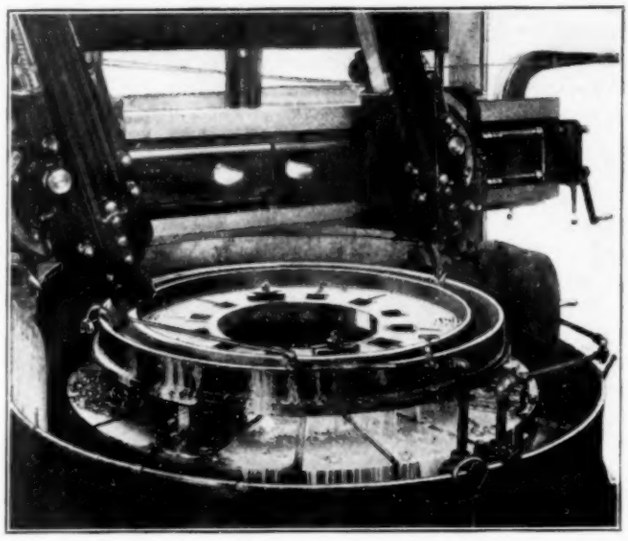


FIG. 3. TURNING A LARGE RING

A Universal Boring Job

A somewhat unusual horizontal boring machine job is shown in Fig. 2. This is the combined cylinder and guides of a logging engine and has the cylinder and guides bored and both ends faced at the one setting. The illustration shows how the work is fastened to the table of the Lucas boring machine, and the way in which the cylinder and guides are bored by cutters *A* and *B* on the boring bar which is supported by the

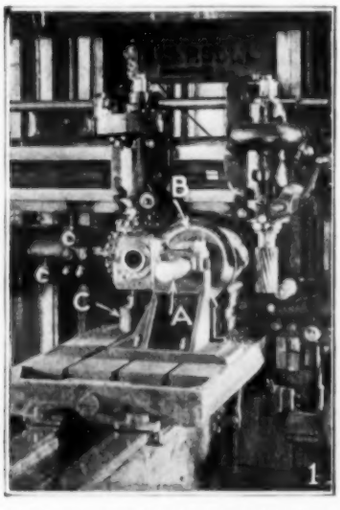


FIG. 1. MILLING CYLINDERS

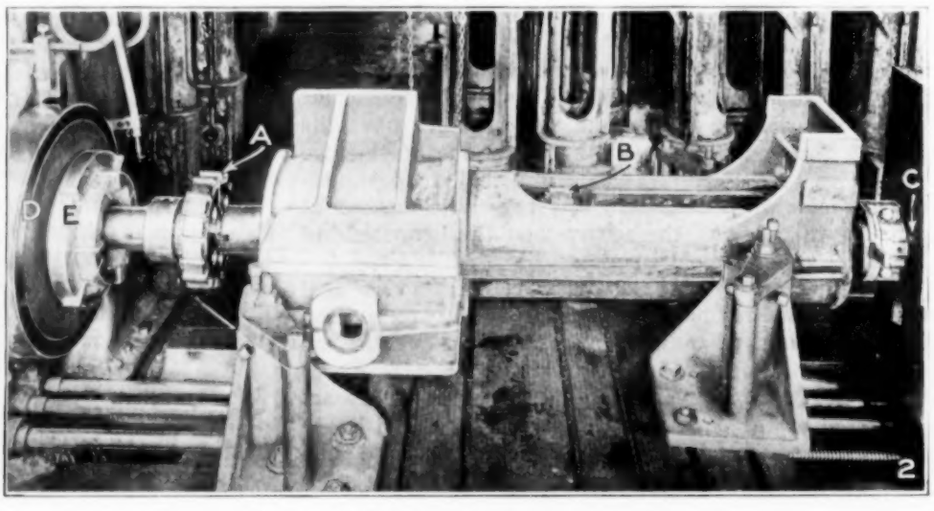


FIG. 2. BORING CYLINDER AND GUIDES

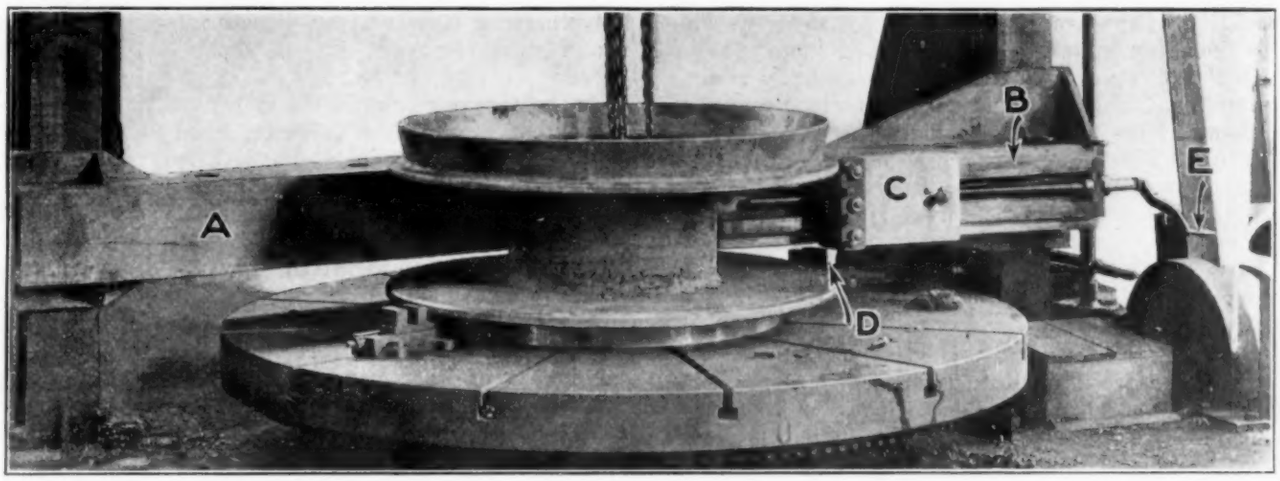


FIG. 4. TURNING DRUM FLANGES

outer bearing at *C*. The outer end of the bar carries the facing cutter shown, while the faceplate *D* carries the combined counterboring and facing cutter shown at *E*.

Another operation, and one which also shows a modern machine, is the job shown in Fig. 3, being bored on a Gisholt double-head vertical boring mill. This is a part of the logging outfit and the size of the chips being taken by both tools indicates very clearly that this work is on a production basis.

Turning on a Boring Mill

Fig. 4 shows the drum of one of the logging outfits and also the way in which a large boring mill has been rigged up for handling this kind of work. The operation is to face down the side surfaces of the drum. The casting *A* goes from one housing to the other, and is so shaped as to pass behind the drum being turned. The right end of this machine has a dovetailed tool slide at *B*, on which the carriage *C* travels. This carriage supports two tools, one being shown at *D*. This arrangement allows the tools to be fed into the work by means of the handle *E* and the sides are thus faced without difficulty.

The turning of the engine crossheads is shown in Fig. 5, the job being done on a large turret lathe. The work is driven by the plate *A* which also centers it on the driving end, while the first center is supported at *B* in one of the corner holes of the turret. Lathes of this kind are not at all plentiful in this section of the country.

An interesting grinding machine, which was built because at the time it was impossible to secure one of standard make, is shown in Fig. 6. The simple con-

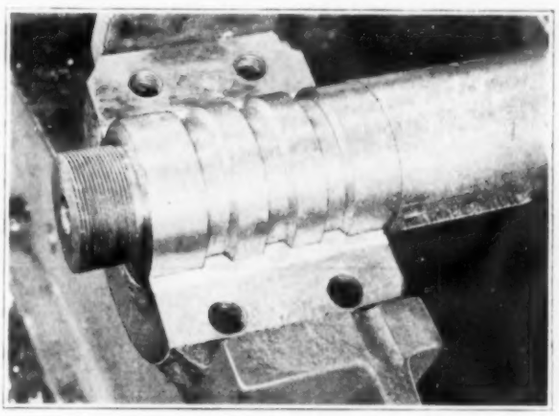


FIG. 7. THE THRUST BEARING

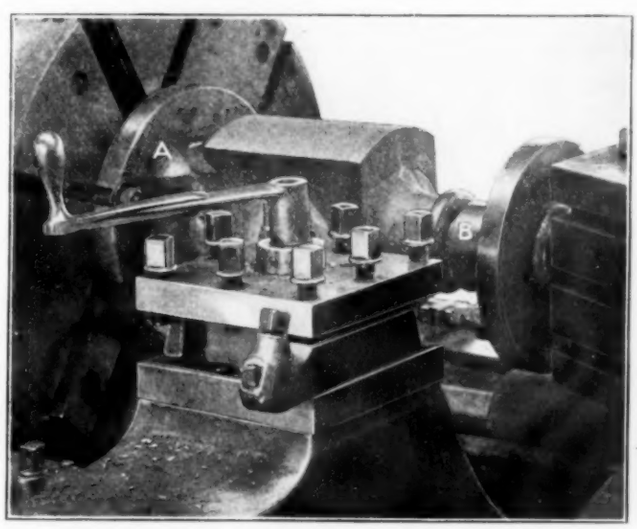


FIG. 5. TURNING THE CROSSHEAD

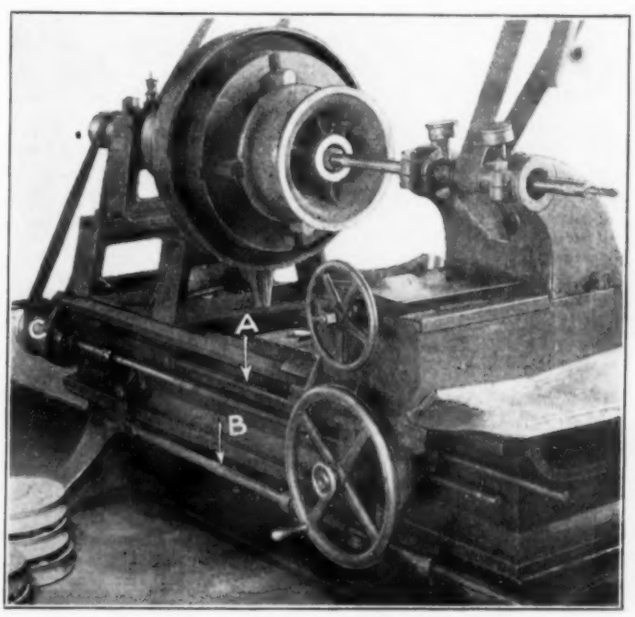


FIG. 6. A LARGE INTERNAL GRINDER

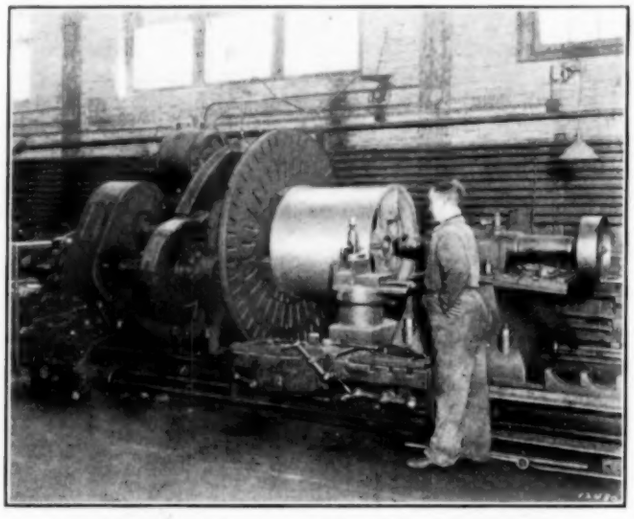
struction of the headstock and the solid way in which the grinding spindle bearings are mounted, attract attention at once. The feed is automatically reversed by means of the shifter rods *A* and *B* which control the shifting of the belt on the pulleys *C*.

The last illustration, Fig. 7, shows the form of thrust bearing used on the hoisting drum shafts in order to prevent end motion. The thrust rings are turned on the shaft and the babbitt poured in position as shown.

A Veteran of Three Wars

BY FRANK R. CALKINS

During a recent visit to the machine shops of the Otis Elevator Co., at Yonkers, N. Y., the writer happened on the venerable lathe shown in the illustration. This machine, of unknown origin, has a history.



A VETERAN—STILL IN SERVICE

At the outbreak of the Civil War, the Star Arms Co., located in Yonkers, N. Y., were awarded large contracts for supplying the Union forces with revolvers. It was a large industry for those days, as more than 1,000 men were on the payrolls.

At the close of the war the firm accepted further contracts for supplying pistols and revolvers to parties connected with the Mexican Government. When the French evacuated Mexico the Mexican Government failed to live up to its agreements and the Star Arms Co. was forced into bankruptcy. The plant equipment was disposed of to manufacturers in different sections of the country.

The lathe here shown was purchased by the Otis Elevator Co. for machining some of the heavier parts of their product. The exact date of purchase is not known as no records now appear on the company's books.

The operator of this lathe, Patrick Harding, has served the Otis Co. for nearly half a century and he states that the lathe was in the plant at the time he entered their employ. Harding has been running this machine for over sixteen years and it is still daily employed in turning and grooving elevator cable drums.

The large ring gear on the back of the faceplate requires renewal about every fifteenth year and the bronze lead-screw-nut demands frequent replacement. The length of the lead-screw and its consequent weight causes a slight sag and the nut rapidly wears out of round. A motor drive has been attached to the lathe but otherwise this survivor of several wars stands in its original form and is still capable of continuous service.

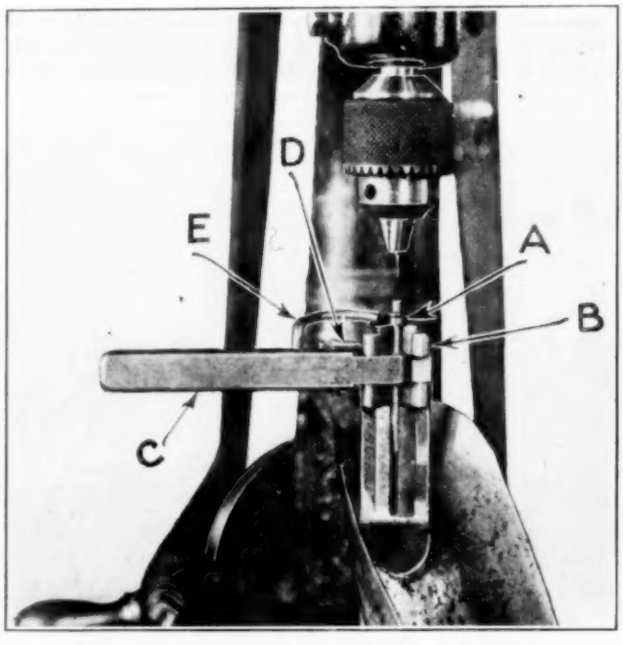
In the endeavor to trace the makers of this lathe, the search ended with C. & G. Place, Pearl St., New York City, machine-tool dealers who have long since ceased activities. Perhaps some machinist may recognize ear marks about this "old-timer" and be able to throw light on its origin.

[There were comparatively few builders of large lathes prior to the Civil War, and nearly if not quite all of them built into their machines certain characteristics by which they were easily recognizable. By process of elimination of other makers because of certain features known to belong to them, our guess is that the lathe in question was built by the Putnam Machine Co. of Fitchburg, Mass. Will any of our older readers venture an opinion?—EDITOR.]

Drilling Ignition-Point Holes in Spark Plug Spindles

BY E. V. ALLEN

In making a spark-plug center or spindle, it is necessary to drill a small hole in the lower end for the insertion of a short piece of wire which forms the central ignition point. As these spindles are made in large quantities they must be rapidly handled. For this purpose we have made the simple jig shown ir the illustration. A spark-plug spindle is shown at *A*, resting in the vertical V-block *B*. The shoulder on the piece rests on top of the V-block, and keeps it from slipping down. While drilling the hole, the spindle is kept from turning by the operator pulling outward on the end of lever *C*. As soon as the hole is drilled and the drill backed out, the operator releases lever *C*, which is immediately pulled back by the small spring *D*. When the lever flies back the end of the curved rod *E* hits the work and knocks it into the chute below. The speed of this device will be readily seen by anyone who takes the trouble to study out the cycle of movement for a piece of work.



DRILLING JIG FOR SPARK-PLUG SPINDLES

SEVEN CENTURIES of BRASS MAKING

By O. A. KENYON
ENGINEER RAY D LILLIBRIDGE, Inc.
NEW YORK

IV. Phono-Electric Wire—Brass and Copper Tubes

The making of phono-electric wire is described. There is information on rolling, joining and drawing. The author specifies that the advantages of phono-electric wire are great toughness, high tensile strength, favorable arcing characteristics and the permanency of these properties under service conditions. Brass and copper seamless tube manufacture is gone into—data on the piercing, cast shell and cupping processes are given.

(Part III appeared in the Nov. 18 issue)

SOME twenty odd years ago, phono-electric trolley wire was developed and placed on the market by the Bridgeport Brass Co. in response to a demand for a contact wire that would withstand the conditions of severe service better than hard-drawn copper. The greatest advantages of phono-electric wire from the railway man's point of view are: Toughness, high tensile strength, favorable arcing characteristics, and best of all, these various characteristics are permanent—the wire does not alter its properties under service conditions, which is one of the most serious disadvantages of hard-drawn copper. These properties of phono-electric wire are due first to the composition of the wire; second, to the uniformity and homogeneity of this composition; third, to the carefully controlled process of manufacture. Phono-electric billets are delivered from the electric casting shop to the rolling mill where they are introduced into a heating furnace, the entrance to one of which is shown in Fig. 27. After having reached the desired temperature, the billet is withdrawn from the furnace by sliding onto a two-wheel car as shown in Fig. 28. It is then wheeled to one of the rolling mills and passed back and forth until it is sufficiently reduced in diameter, when it is coiled up and delivered to the wire mill. Figs. 29 and 30 show the billet at two stages of the rolling process. The coiled rod before going to the draw benches is joined into long lengths by soldering. The joint is prepared by sawing the ends at an acute angle, clean-

*Booklet published by the Bridgeport Brass Co., Bridgeport, Conn.

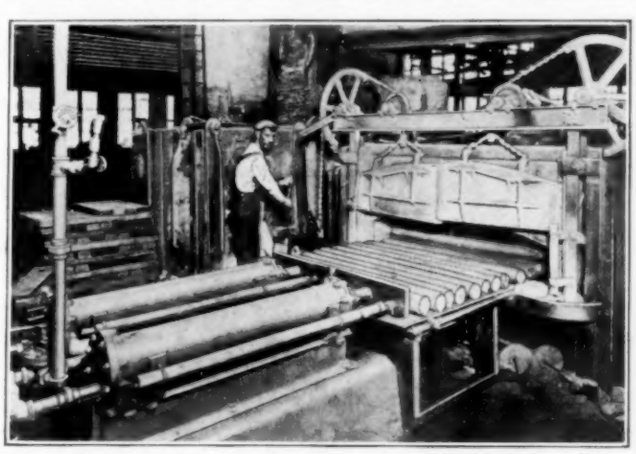


FIG. 27. PHONO-ELECTRIC BILLETS ENTERING THE HEATING FURNACE

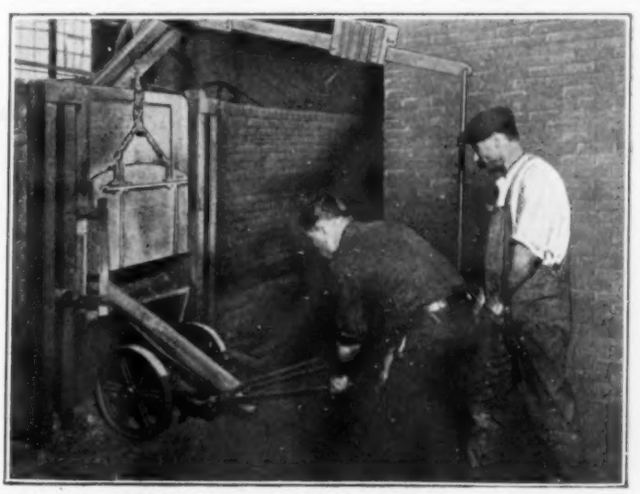


FIG. 28. REMOVING A PHONO-ELECTRO BILLET FROM THE HEATING FURNACE PREPARATORY TO INSERTING IT IN THE ROLLS

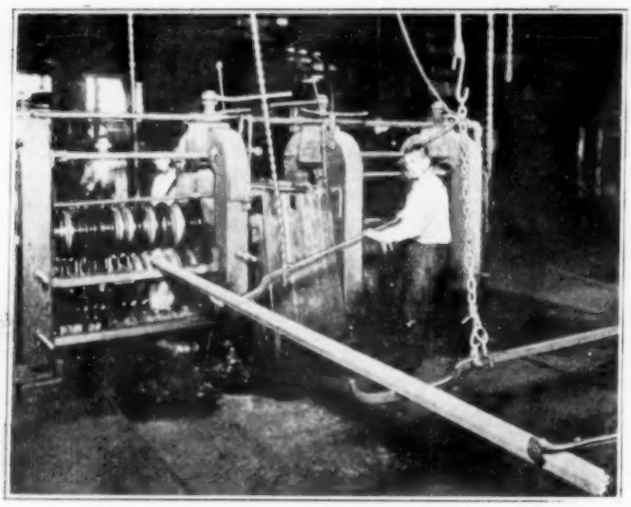


FIG. 29. THE SAME BILLET AS SHOWN IN FIG. 28 AFTER THE THIRD PASS THROUGH THE ROLLS

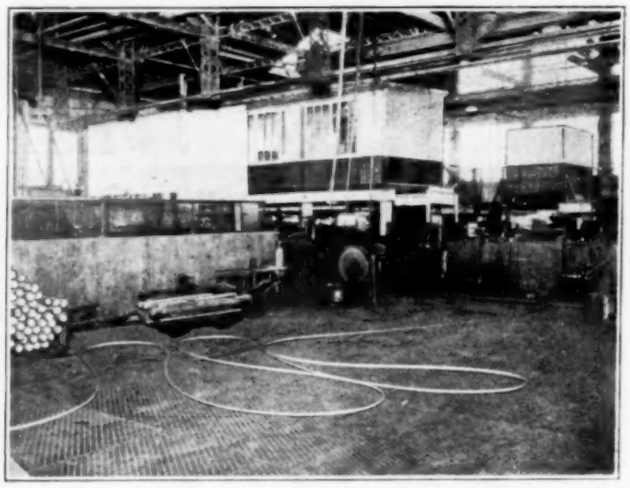


FIG. 30. THE SAME BILLET AS SHOWN IN FIG. 28 JUST BEFORE THE LAST PASS THROUGH THE ROLLS

ing the adjacent surfaces with acid and inserting between them a sheet of silver solder. They are next bound together with wire and a brazing furnace swung into position to enclose the joint. After heating to the proper temperature the operator applies more silver to the joint and works it in thoroughly. Having completed the operation, the furnace is dropped down, the wires removed and the joint smoothed up with a file. In Fig. 31 is shown the soldering equipment for two men. The joint in the foreground has just been completed, while the other one is being heated in the furnace.

The drawing of phono-electric takes place in the usual way except that extraordinary care is exercised to maintain accurate dimensions. The die itself is special. It is so designed and manipulated that strains are equalized and any unbalanced wear prevented. Fig. 32 shows the soldered rod undergoing the first draw. It passes from the rod reel through the die to the drum of the drawing machine and after making several turns around the drum it is wound up on a reel ready for the next operation.

The Bridgeport Brass Co. has been making seamless brass and copper tubing for over thirty years, being one of the pioneers in the making of this product. The processes employed in making seamless tubing impose extremely severe conditions on the brass maker if success is to be attained. To begin with, it is all-important that the quality of the metal be definitely known and uniformly maintained for any given result. Years of study in the research laboratories and even more years of practice in the mill have taught this company what conditions are necessary to the making of seamless brass and copper tubes for any given purpose, and equipment has been provided to realize these conditions on a manufacturing basis.

FIG. 31. PHONO-ELECTRIC RODS ARE SOLDERED INTO LONG LENGTHS WITH SILVER

FIG. 32. PHONO-ELECTRIC ROD PASSING THROUGH THE DIE FOR THE FIRST DRAW

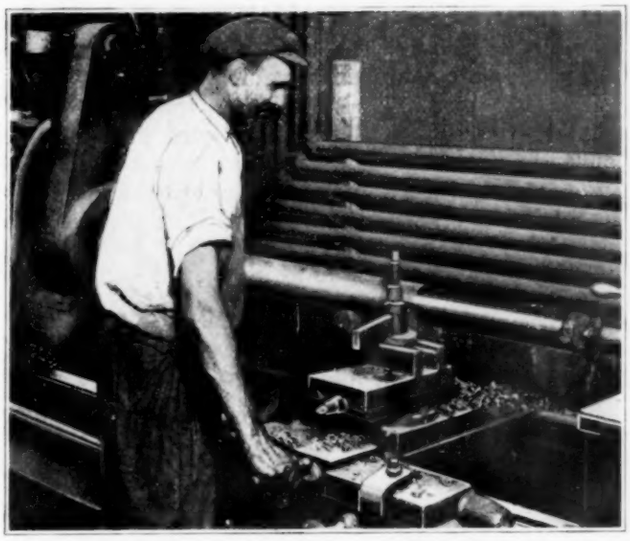


FIG. 33. TAKING CUT OFF BRONZE BILLET OF SPECIAL TURBINE BLADING METAL

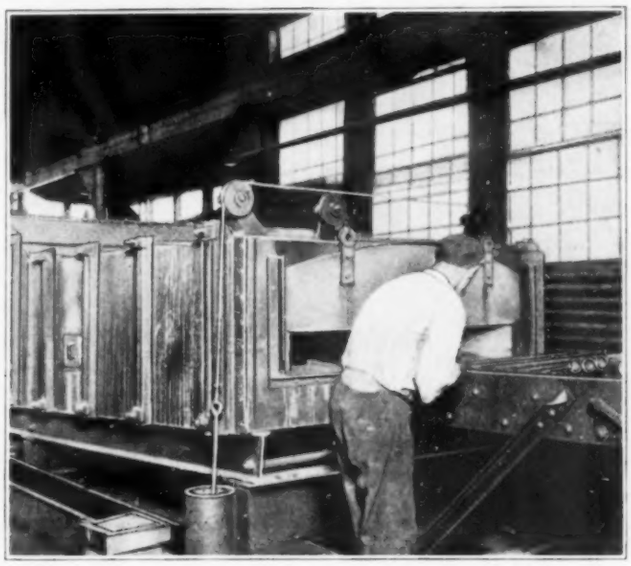


FIG. 35. BILLETS ENTERING THE HEATING FURNACE PRELIMINARY TO ENTERING THE PIERCING MACHINE

Although there are several different methods of making seamless tubing, practically all tubing made by the Bridgeport company falls under three processes, namely: the piercing process; the cast shell process; and the cupping process. The choice of these three is determined by the character of the tube to be produced. Taking up the piercing process first, cast billets.

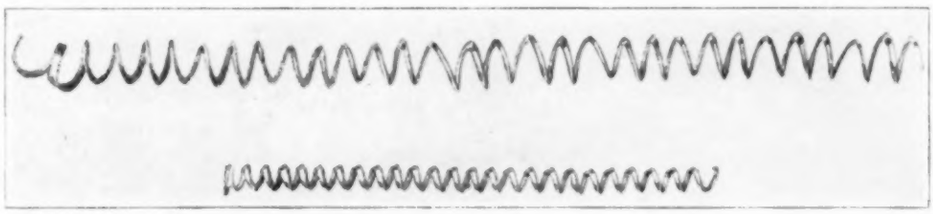


FIG. 34. CHIPS REMOVED FROM THE SURFACE OF THE BILLET SHOWN IN FIG. 33

slightly cupped at the end and of suitable diameter, are delivered to the piercing mill from the electric casting shop.

Billets used in this process are turned so as to remove surface impurities and mechanical imperfections, and in this way insure greater perfection in the surface of the tube. Fig. 33 shows the turning of a billet. Fig. 34 shows chips removed from the surface of the billet. When it is considered that these chips are taken from the surface of a cast billet, it is evident that the casting itself closely approaches physical perfection.

In Fig. 35 we see these billets on their way into a heating furnace. In this furnace they are brought to the proper temperature and discharged at the proper moment into the intake end of the piercing machine as shown in Fig. 36.

The operator of the piercing mill by means of a motor controller causes the billet to be inserted into the piercing machine by rotating the rollers upon which it rides.

Once in the machine, it is subjected to a cross rolling action, the result of which is to cause the billet to travel through the rolls. Just as it leaves the rolls it encounters a projectile-like steel point carried on a long rod over which it is forced, rotating the meanwhile between the rolls just ahead of the point. The working parts of this very interesting machine consist of two

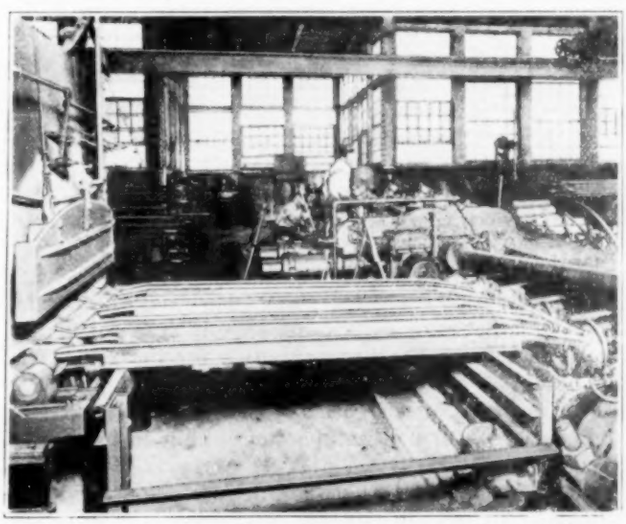


FIG. 36. A HOT BILLET, AFTER LEAVING THE HEATING FURNACE SHOWN IN FIG. 35, ABOUT TO ENTER THE PIERCING MACHINE

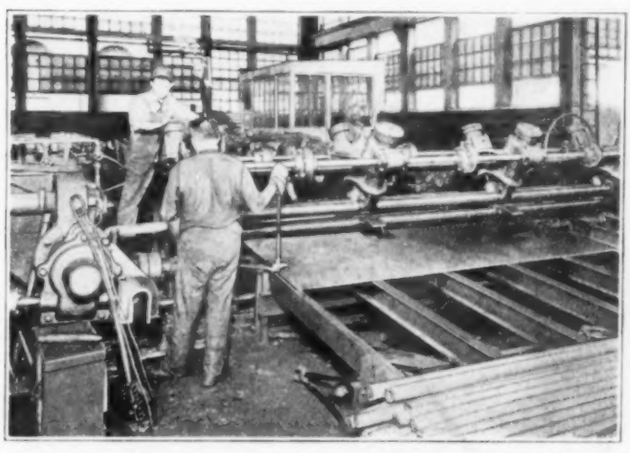


FIG. 37. THE PIERCED TUBE, EMERGING FROM THE ROLLS AND PASSING OVER THE ROD WHICH CARRIES THE PIERCING POINT

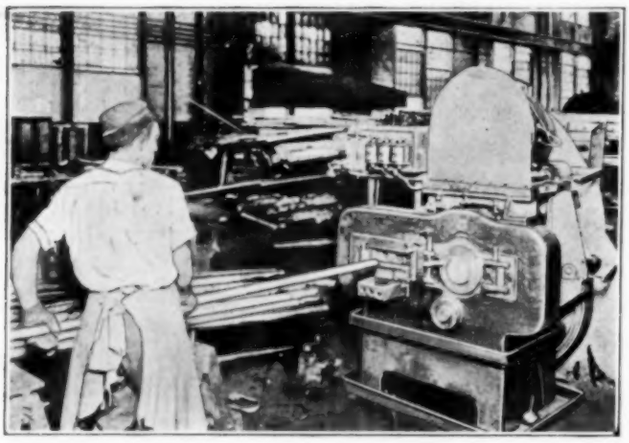


FIG. 38. POINTING TUBING PRELIMINARY TO DRAWING

tirely through the machine the rod is withdrawn by a traveling workhead. The ends of tubes produced by this process are shown in the foreground.

From the piercing mill the tubes go to the draw benches, where they are pointed and drawn. The pointing operation is shown in Figs. 38 and 39. It consists simply of smashing down the end of the tube sufficiently to allow its insertion through the die and into the grip.

The openings into one of which the tube is about to be inserted are split and are opened and closed continually under the action of the driving mechanism. The holes just below the pointing dies serve as gages into which the pointed tube must fit.

In Fig. 40 is shown a general view of the main tube plant. Practically all the equipment in this plant is special. One type of tube draw-bench alone contains ninety-three elements that are covered by patent claims. Before this mill was built, an experimental mill was set up and every detail of the process worked out experimentally and theoretically before the final decision as to design to be used in the plant was made. Fig. 41 shows a group of tube draw benches. At the right is seen a tube partially through the die. The rod here shown carries the plug or triblet, which is held inside of the tube at the point where it passes throught the die and maintains the internal diameter as well as preventing deformation of the circle. In the outer end of the tube is seen a bushing which serves as a bearing and guide for the rod. The tube itself is drawn by the action of an hydraulic plunger, located on the other side of the die. These machines are so long that photographing is extremely difficult.

After each draw the tubes are delivered to continuous annealing furnaces which are maintained at constant temperature, the tubes traveling at a definite speed through the furnaces. In Fig. 42 is seen a set of tubes

power driven rolls, mounted at an angle to one another and having their cylindrical surfaces made up of the frustums of two cones. Just below and between these two driven rolls, is a small idler. The billet passes between the three and is drawn in by the spiral travel of the three rolls, the angles being such that the point of contact travels on the same spiral on all three rolls, giving the billet a powerful forward motion. Fig. 37 shows a tube issuing from the machine. The rod with the piercing point is inside. The points have to be changed from time to time in order to maintain the proper contour. A point that has just been removed from the machine is shown resting on a block in the left foreground. When the billet has been forced en-

FIG. 40. A GENERAL VIEW OF THE MAIN TUBE PLANT

FIG. 39. VERTICAL POINTING MACHINE FOR LARGE SIZE TUBES. THE OPERATORS ARE JUST REMOVING A TUBE FROM THE MACHINE

FIG. 41. DRAWING TUBING

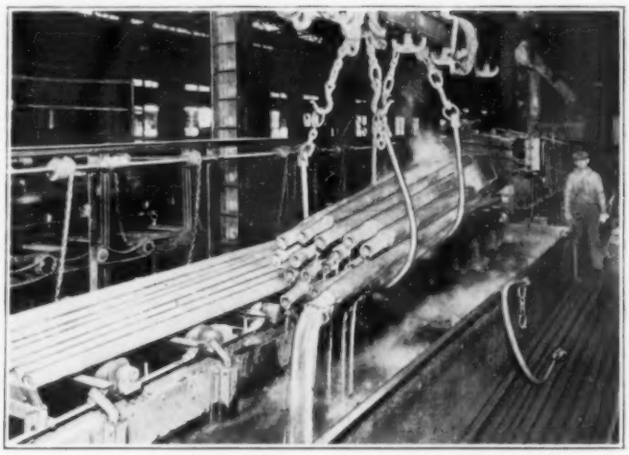


FIG. 43. A BATCH OF TUBES REMOVED FROM THE PICKLE TO BE RETURNED TO THE DRAWBENCHES FOR THE NEXT DRAW

on the conveyor which have just emerged from the furnace and are ready to dump into the pickle. The method by which the conveying rolls are driven is plainly shown in the machine just back of the one in the foreground. The tubes here shown are just about to be dumped into the pickle which is accomplished by the operator in the background. The temperature of the furnaces and the speed of travel through them is so chosen, that the mechanical strains from the drawing operation are equalized without detriment to the physical properties of the tube. Fig. 43 shows a bunch of tubes being lifted from the pickle to be carried back to the draw benches for the next operation. This operation of annealing is of the greatest importance since it has a marked effect on the distribution of stresses in the walls of the tube and acts to prevent what is known as "season cracking."

The importance of proper annealing cannot be over emphasized. The Bridgeport Brass Co. has studied the annealing operation with respect to temperature, rate of heating and cooling, and as a result of these studies has formulated exact specifications covering both these factors for every quality of metal turned out by the mills. In Fig. 44 the results of experiments on a certain alloy are shown graphically. From this diagram it is seen that the annealing temperatures affect vitally all the physical properties of the metal, and when properly

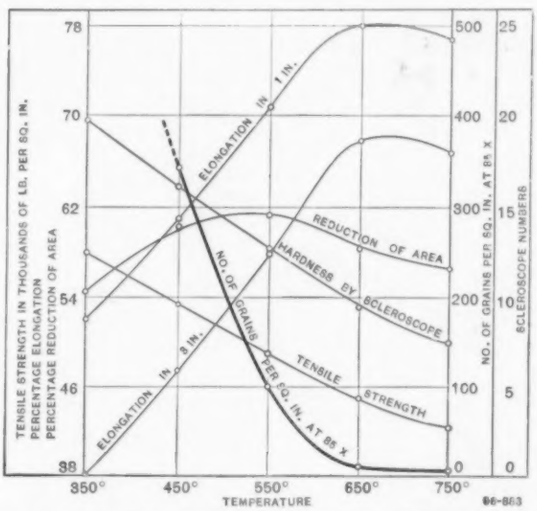


FIG. 44. DIAGRAM SHOWING EFFECT OF ANNEALING TEMPERATURE UPON PHYSICAL PROPERTIES FOR BRASS OF A GIVEN COMPOSITION

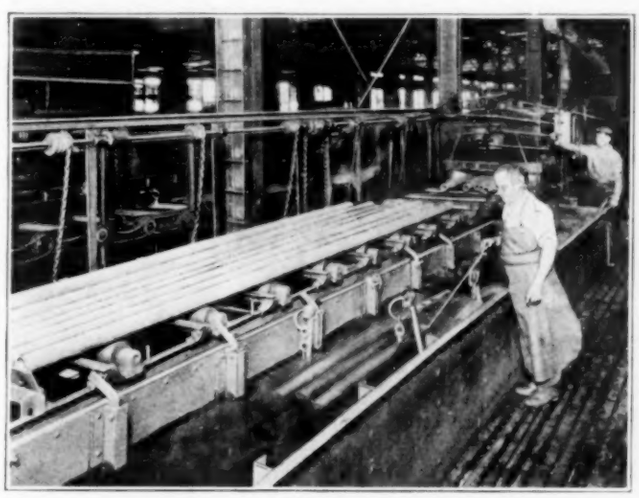


FIG. 42. A BATCH OF TUBES ISSUING FROM A CONTINUOUS ANNEALING FURNACE

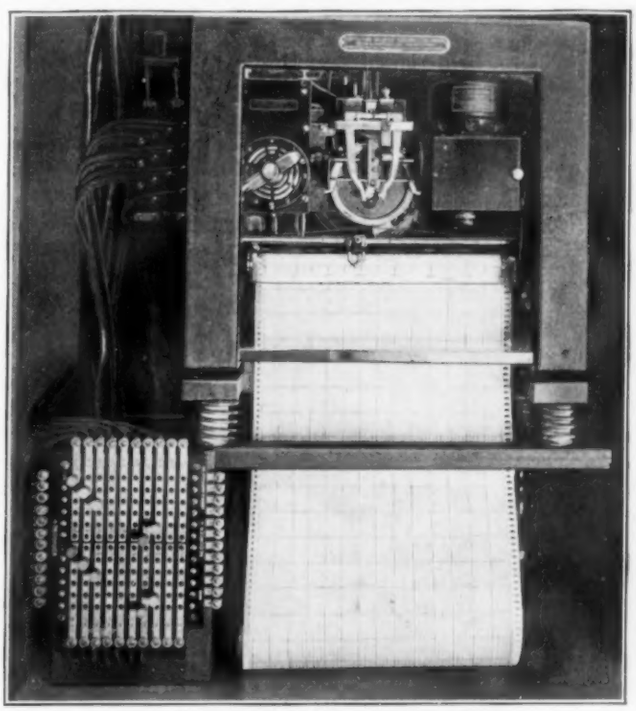


FIG. 45. RECORDING PYROMETER

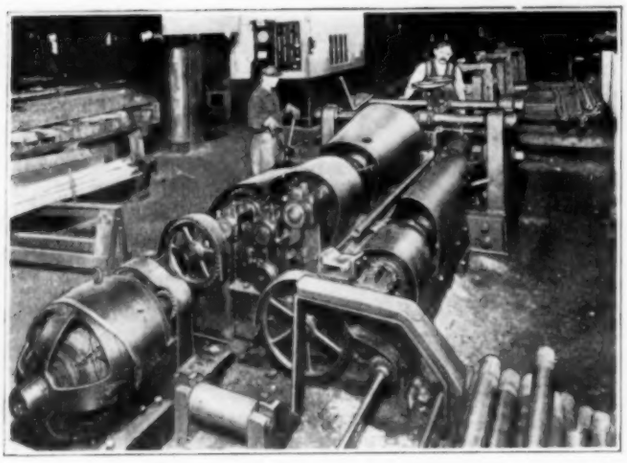


FIG. 46. A TUBE PASSING THROUGH THE SPIRAL ROLLS OF A STRAIGHTENING MACHINE

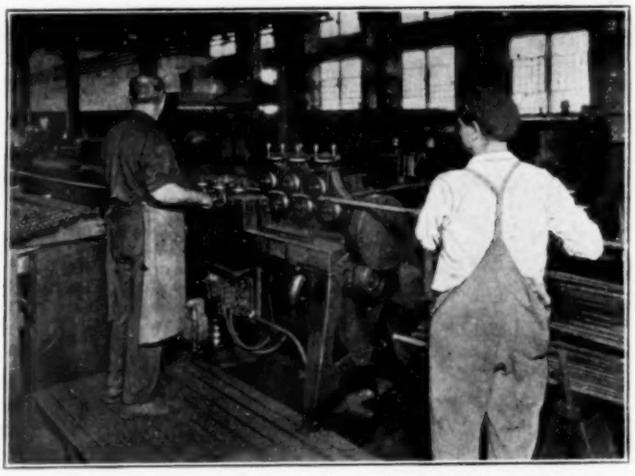


FIG. 47. STRAIGHTENING CONDENSER TUBES

FIG. 48. SAMPLING CONDENSER TUBES FOR INSPECTION TESTS

FIG. 49. CUTTING STRAIGHTENED CONDENSER TUBES TO STANDARD LENGTH

understood can be used to obtain certain desired properties.

The temperature of the annealing furnaces is measured with electric pyrometers, the indicating instruments being used by the operators for making heat adjustments, and the recording instruments used for information of the engineers as well as for the operators, so that the exact history of any given batch of metal can be recorded. In Fig. 45 is shown one of the recording instruments.

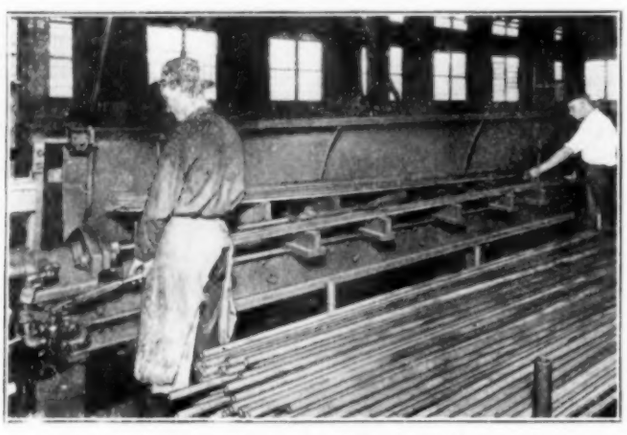


FIG. 50. HYDRAULIC TEST OF CONDENSER TUBES

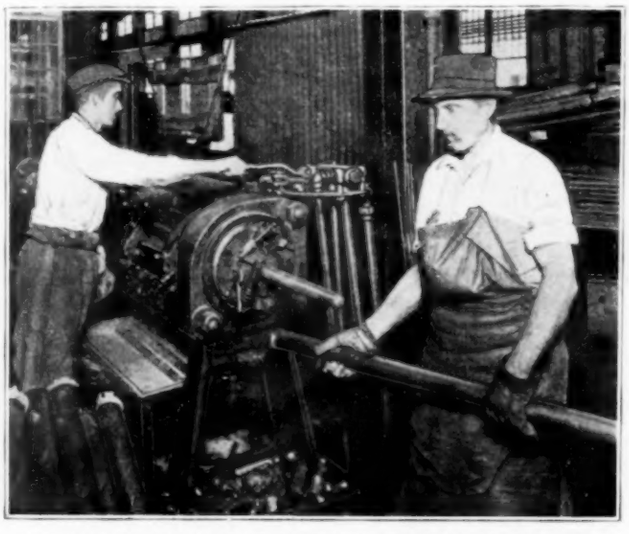


FIG. 51. DRAWING TUBES BY THE CUPPING PROCESS

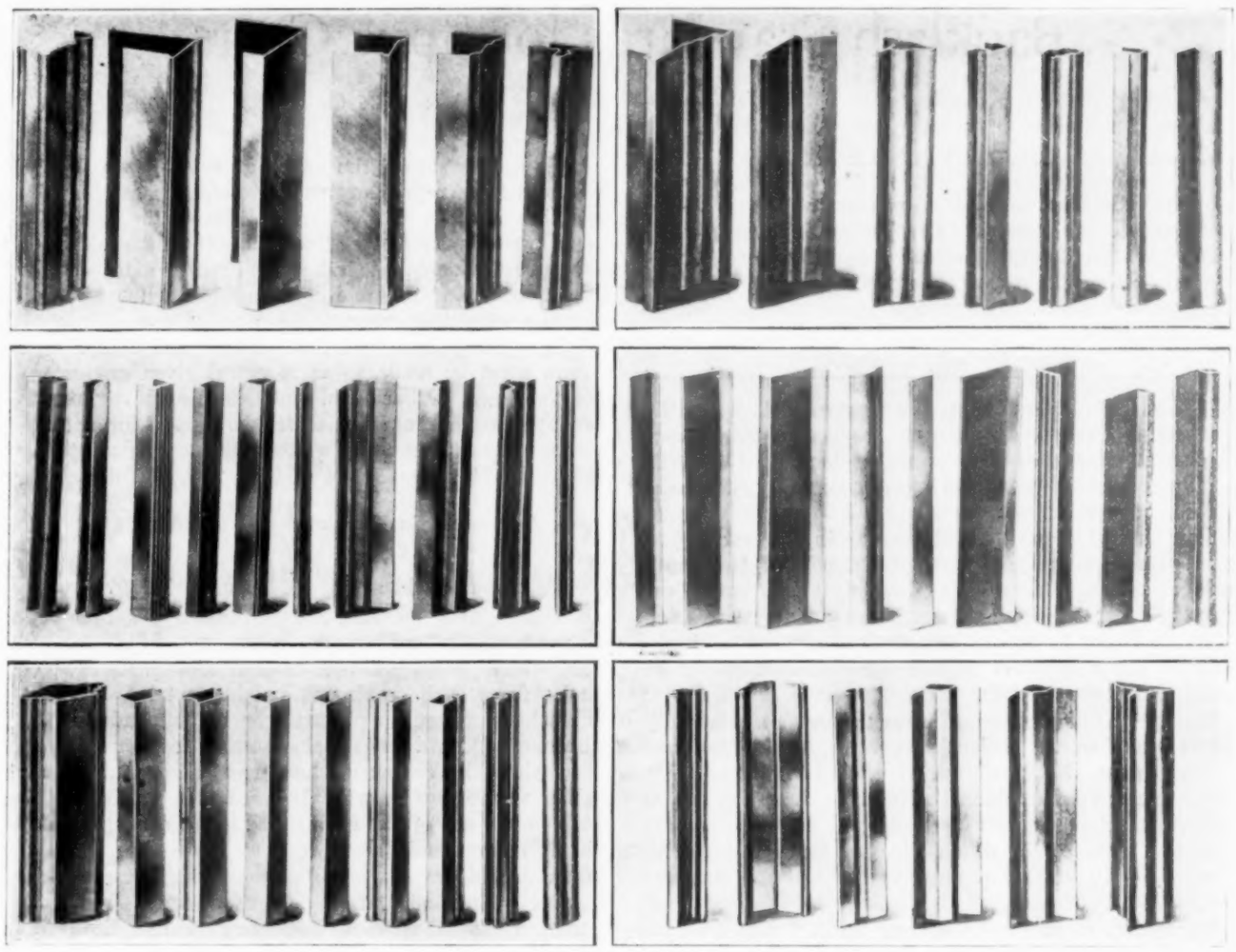


FIG. 52. SECTIONS OF DRAWN TUBING

When the tubes have been drawn to the proper diameter and gage, they are straightened by passing them through a set of rollers. The large diameter tubes are passed through rollers which travel in a spiral around the tube as shown in Fig. 46, while the small tubes such as those used for condensers are straightened by passing through a series of rolls in two different planes as shown in Fig. 47. Both of these straightening machines spring the tube in such a way as to tend to equalize any unbalanced mechanical strains that exist and thereby improve the service qualities of the tubing.

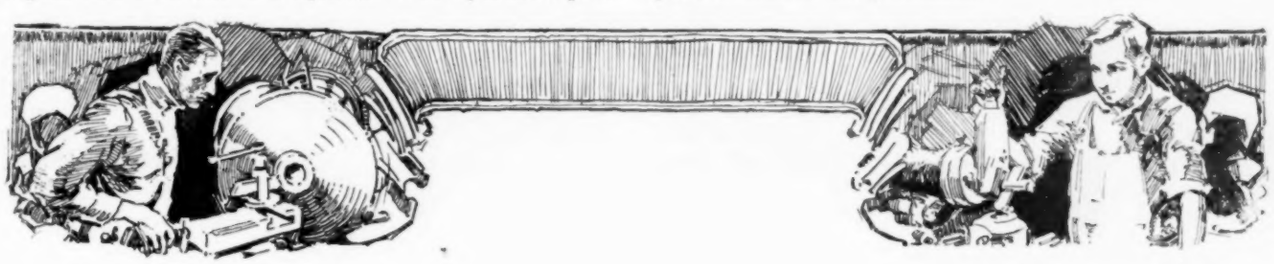
In order to control the quality of the product, samples are subjected to whatever tests are necessary to establish the properties of the tube required for the particular service they are to perform. In Fig. 48 is shown an inspector marking samples to be delivered to the laboratories. A certain percentage of all tubes manufactured are thus sampled for analyses and tests in the laboratory.

After straightening the tubes are sawed to standard lengths and each one is subjected to an hydraulic pressure test. These various operations are shown in Figs. 49 and 50.

In addition to pressure tests, each tube is examined by an expert and checked for dimensions and general quality before it is delivered to the shipping department for packing and shipment.

The cupping process, although used only to a small extent, is preferred for certain kinds of tubing. In this process, the metal is pushed through a die by a round nosed punch. An operation of this kind is shown in Fig. 51. In the liquid bath under the machine may be seen several tubes ready for the drawing operation. The operator at the right is holding a similar tube after the drawing operation. This tube is now ready for an annealing and pickling, after which it will be returned for the next draw and so on until the finished size is attained.

Although the bulk of the tubes are circular in section, other sections are also drawn. Fig. 52 shows a number of special sections and serves simply to indicate the possibilities of the processes.



Backlash Standards for Spur Gears

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Standardization of gear characteristics is gradually coming about. The author suggests a formula for determining the proper backlash for spur gears, and tables, computed from the formula, are given. The article paves the way for discussion on the subject.

IT IS well known that spur gears cut with the involute form of tooth may be assembled at any desired center distance, and, as long as the teeth are in engagement, they still operate correctly. Perhaps this is too well known, as it has led to a general misunderstanding of an essential point in the cutting of spur gears. Simply because the depth of the tooth engagement may be varied as desired, it does not follow that the depth to which the teeth are cut may be varied either in order to secure any desired amount of backlash or for a modification of the center distance at which the gears operate.

The pitch diameters of spur gears automatically increase or decrease as a corresponding change is made in the center distance, but, it should be noted that the base circle from which the teeth in the gears derive their formation remains constant and does not change with any position in which the gears may be placed. Thus, in Fig. 1, the only change is in the pitch diameters and obliquity of action.

Therefore, to produce a correct tooth form, the base line of the gear being cut and the base line from which the cutter is formed must be brought into agreement—that is, the cutter must be located at a definite distance from the center of the gear in order to assure a correct tooth profile. In case an attempt is made to cut deeper or shallower than this, the involute curve will be distorted and an incorrect form of tooth will result. For large numbers of teeth the amount of damage done is relatively small, but for small pinions the proper location of the cutter is vital.

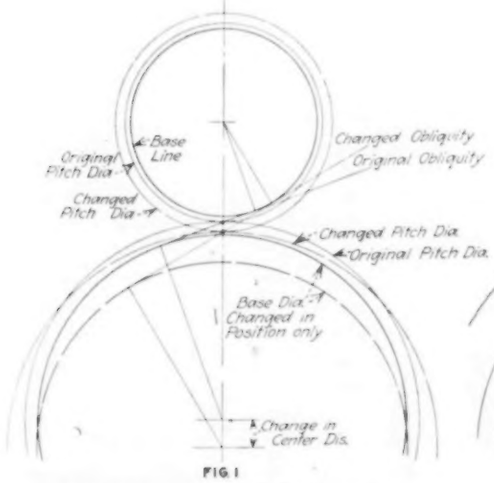


FIG. 1. EFFECT OF CHANGE IN DISTANCE BETWEEN GEAR CENTERS

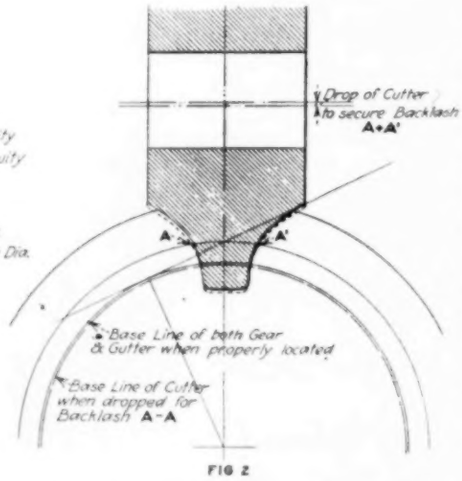

Drop of Cutter to secure Backlash A-A'
A
A'
Base Line of both Gear & Cutter when properly located
Base Line of Cutter when dropped for Backlash A-A
FIG 2

FIG. 2. EFFECT OF CUTTING TOO DEEPLY IN GEAR BLANK

In Fig. 2 is shown the effect of cutting too deeply. The solid lines represent true involute form, when the base line of both the cutter and the gear being cut are in agreement. Dotted lines show the cutter dropped to secure backlash, as indicated by the distances *A*. A comparison of the two constructions will make evident the resulting error.

It is evident, therefore, that all spur and helical gear cutters must be made so as to cut a given amount of side clearance, or backlash, and this necessarily means standardizing the amount which is proper for various pitches. To this end the writer suggests an allowance based upon the square root of the pitch, as follows:

$$\text{Average Backlash} = \frac{0.018}{\sqrt{D}}, \text{ or } 0.01\sqrt{C}.$$

$$\text{Minimum Backlash} = \frac{0.0135}{\sqrt{D}}, \text{ or } 0.0076\sqrt{C}.$$

The "average" allowance is recommended for all gears which are to be heat treated, the run-out which results from such treatment causing a need for more backlash than would ordinarily be recommended. The "minimum" allowance is recommended for general purposes when the center distance can be depended upon and is accurately known. In cases where the center distance has any great minus value, the average allowance is recommended.

In case cutters are made without any allowance for backlash, the calculated center distance must be increased, as it is then necessary to cut the teeth standard—that is, the circular thickness must then equal one-half the circular pitch. Also, in case a certain amount of backlash has been allowed for in making the cutter and it becomes necessary to increase this amount, the only proper solution is to increase the distance between centers. The only manner in which this increase can be avoided is to take side cuts, that is, rolling the gear against the cutter.

The logical solution would be to reduce the thickness of the teeth of the gear to give the full amount of backlash desired—there being a surplus of strength in the gear teeth—and to cut the pinion teeth standard, that is, one-half the circular pitch. But, it is very often necessary to engage two pinions, as gears having small numbers of teeth are commonly called, so that it would appear that the backlash for an interchangeable standard must be divided equally between the gear and the pinion teeth.

Table I gives calculated values for "average" backlash, based upon $\frac{0.018}{\sqrt{D}}$, or $0.010\sqrt{C}$. These values should, of course, be grouped, as it is unnecessary to follow the exact value as

TABLE I. RELATION BETWEEN PITCH AND BACKLASH FROM THE FORMULA: AV. BACKLASH = $\frac{0.018}{\sqrt{D}}$, or $0.01\sqrt{C}$

D	*C* Inches	Backlash, Inches	*D*	*C* Inches	Backlash, Inches
...	10	0.0320	3½	..	0.0097
...	9	0.0305	...	¼	0.0094
...	8	0.0290	4	..	0.0090
...	7	0.0270	...	¾	0.0084
⅛	..	0.0260	5	..	0.0080
...	6	0.0250	...	½	0.0076
...	5	0.0230	6	..	0.0073
¼	..	0.0215	...	½	0.0070
...	4	0.0203	7	..	0.0067
...	3½	0.0190	8	..	0.0063
...	3¼	0.0184	...	¾	0.0061
1	..	0.0180	9	..	0.0060
...	3	0.0179	10	..	0.0057
...	2¾	0.0169	11	..	0.0054
1¼	..	0.0162	12	..	0.0052
...	2½	0.0161	...	¼	0.0050
...	2¼	0.0153	14	..	0.0049
1½	..	0.0148	16	..	0.0045
...	2	0.0142	18	..	0.0041
1¾	..	0.0139	20	..	0.0039
...	1¾	0.0135	22	..	0.0038
...	1½	0.0130	24	..	0.0037
2	..	0.0127	26	..	0.0036
...	1¼	0.0125	28	..	0.0034
2¼	..	0.0123	30	..	0.0033
...	1⅛	0.0121	32	..	0.0032
2½	..	0.0120	34	..	0.0031
...	1¼	0.0114	36	..	0.0030
2¾	..	0.0110	60	..	0.0029
...	1⅛	0.0107	80	..	0.0020
3	..	0.0103	100	..	0.0018
...	1	0.0100	120	..	0.0012

given there. The arrangement shown in Table II might be recommended as a standard.

TABLE II. APPROXIMATE RELATIONS BETWEEN PITCH AND AVERAGE BACKLASH

Circular Pitch, Inches	Backlash, Inches	Diametral Pitch, Inches	Backlash, Inches
10 and over	0.032	0.5	0.026
8 to 9¼	0.030	0.75	0.020
7 to 7¾	0.028	1.0	0.018
6½ to 6¾	0.026	1¼	0.016
5½ to 5¾	0.024	1½	0.015
4½ to 5	0.022	1¾	0.014
3½ to 4½	0.020	2	0.013
3 to 3½	0.018	2½	0.012
2½ to 2¾	0.016	2¾	0.011
2½	0.015	3–3½	0.010
2	0.014	4	0.009
1¾ to 1¾	0.013	5–6	0.008
1½ to 1¾	0.012	7–8	0.007
1¼	0.011	9–10	0.006
1 to 1¼	0.010	11–16	0.005
⅞ to ⅞	0.009	18—26	0.004
⅞	0.008	28–60	0.003
¾	0.007	80–100	0.002
⅝	0.006	Over 120	0.012
½	0.005		

The distance from the pitch line to the outside diameter of the cutters being held correct, we might depend upon the bottom diameter of the gear for correct cutter location. In setting up the gear-cutting machine, we could then measure from the center of the work spindle to the outside diameter of the cutter.

Dropping the cutter into the gear until the desired tooth thickness is secured is poor practice, unless the amount of tooth space desired is embodied in the design of the cutter. It is, therefore, suggested that the amount of backlash for various pitches be standardized and all form cutters made in strict accordance with this allowance.

Is This a Punch-Press Job?

BY HUGO F. PUSEP

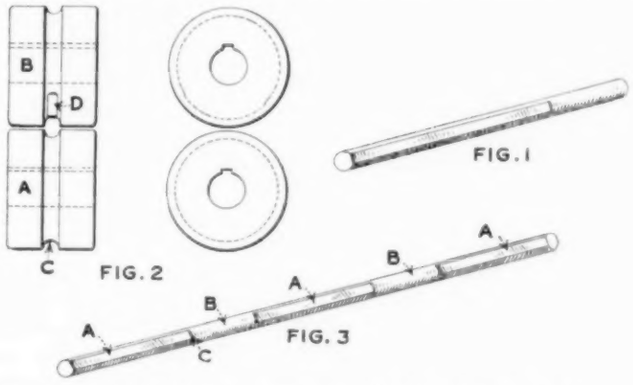
The rod with a flat on it described by F. C. Hudson on page 1267, vol. 52, of the *American Machinist* and supplemented on page 372, vol. 53, of the same journal by Joran Kyn, can be manufactured very cheaply in large quantities.

If I remember right, the rods in question were made of cold rolled steel about ⅞ in. in diameter with the flat extending over about two-thirds of their length, somewhat similar to Fig. 1.

This flat can be rolled very easily, it being comparatively shallow in comparison to the diameter of the rods. The rolling equipment would consist principally of two rolls *A* and *B*, as shown in Fig. 2. Roll *A* would have a perfect semicircular groove *C* cut around its perimeter, while the roll *B* must have the semicircular groove on only a certain length of its perimeter; the rest of the groove having a flat bottom as at *D*. These rolls can be mounted in a substantial fixture having provision made for adjustment. Driving power for the rolls can be obtained from various sources, depending on the quantity of rods to be produced. For a medium production the rolling fixture can easily be mounted on a milling machine table or on a horizontal boring machine of sufficient power, and driven direct from the machine spindle through a suitable connection.

Should the production warrant it, an individual electric motor and reduction gearing, installed as a unit with the fixture, will supply an ideal drive. Under these conditions, however, the fixture would become a special machine. Some other improvements could be made in a case of very large production, such as separate feeding rolls, cutting off mechanism, etc.

Now using mill length cold rolled rods ⅞ in. in diameter as the raw material and passing them through the rolls such as shown in Fig. 2, at every revolution of the



FIGS. 1, 2 AND 3. THE WORK AND THE ROLLS

rolls we would have a flat part *A* and the original round rod *B* alternately for the entire length of the rod, as shown in Fig. 3. Our next step would be to shear this long rod up into several shorter lengths. This can be accomplished very cheaply in an ordinary rod shearing die under a punch press locating from the small shoulders *C*, Fig. 3.

There are a few modifications of the rolls, which would be largely determined by the quantity of rods to be made and the quality and accuracy of finish at each end of same; such as making the rolls large enough so that several flat and round lengths could be rolled at one revolution of the rolls; or having the round and flat bottomed groove slightly longer around the perimeter of the forming roll than is actually necessary, so as to allow for facing operation at both ends after shearing off the rods.

This method of rolling flats on round rods is the cheapest and best way where the quantity is considerable, and it has proven very satisfactory to me on several occasions. I hope that it will help to solve the problem referred to at the beginning of this article.

Modern Aviation Engines—VI

By K. H. CONDIT
Managing Editor, *American Machinist*

THE four engines shown on the opposite page are representative of American designs for commercial aviation. The Thomas and Sturtevant engines are essentially alike, both being V-type eights with reduction gearing between the crankshaft and the propeller. They differ in carburetor location, the Thomas carburetor being overhead between the cylinder blocks while the Sturtevant carburetor is carried on a level with the base of the engine; and, in valve arrangement, the Thomas cylinders are of the L-head type, an unusual design for an aviation engine, while the Sturtevant valves are overhead and operated by rockers and long push-rods from the camshaft which is located in the crankcase.

The Packard engine shows the effects of the information made available by the war of the details of both allied and enemy airplane engines. Valve action and cylinder construction are similar to the Liberty motor designs for those parts, while the cylinder angle has also been reduced from the normal 90 deg. to 60 deg. The carburetor location and intake-manifold design are original but show the effect of German practice. The water pump location is the same as on the Hispano-Suiza.

The Curtiss six shown is practically a half portion of the twelve mentioned in the first installment and has been designed to replace the old reliable, but obsolete, model OX with which most of our army pilots learned to fly. In this motor also, the effects of foreign practice are discernible. The aluminum cylinder casting with threaded steel liners points to the Hispano-Suiza arrangement but the combination of cylinder casting and crankcase upper half is different. Hispano practice is also followed in the elimination of push-rods and rocker-arms for the valve-operating mechanism, but the cams, instead of acting directly on the valve stems, bear on yokes which connect the two inlet or exhaust valves of each cylinder. Two camshafts are fitted, one for the inlet and the other for the exhaust valves.

The problem of making a living in peace times under present conditions is a difficult one for the American airplane manufacturer to solve. The art of flying has not as yet been sufficiently developed to stand alone without governmental aid and those in authority seem to have learned little from the experience of the aircraft program. Much time would have been saved and our part in the war in the air would have been much more valuable than it was if the starved little airplane manufacturing companies that existed before the war had been given a little encouragement in the way of Government orders. There is a world of difference between intelligent economy and stupid parsimony.

The work of the few Army and Navy officers assigned to aviation duty has been very commendable in view of the handicaps under which they have labored, but it could have been so much more effective if sufficient funds had been provided to carry on the work. During the war efficient expert organizations were built up at the scientific and experimental fields and much valuable machinery and testing apparatus were installed. The equipment remains but most of the men have returned to civil life, according to figures given out Oct. 1, which show a reduction in the Air Service of 92 per cent. In England, on the contrary, the testing and experimental forces are to be kept at full war strength to carry on the work of research and development hardly possible by private concerns.

What is left of our Air Service is doing valuable missionary work in educating the people to the possibilities of commercial aviation by the recruiting, demonstrating and photographic tours that are being carried out. Their participation in the Mineola-Toronto race and the transcontinental race have done much to prove the reliability of aërial transportation.

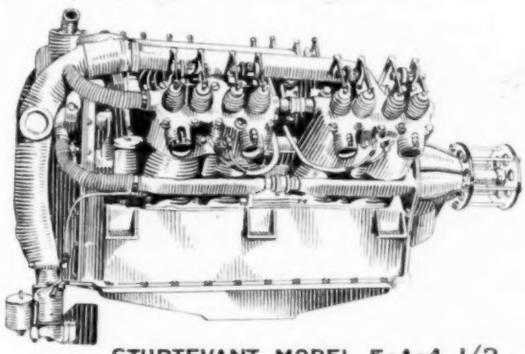
The work of the Navy in the successful transatlantic flight of the NC-4 is beyond praise and from a practical point of view was of far more value than the more daring and spectacular non-stop trip made by Brown and Alcock in the British Vickers-Vimy bomber.

That the British are wide awake to the importance of demonstrations of the sort is evident by the exhibition trip of a flying-boat over the various Scandinavian countries where aviation progress has lagged but where interest is keen.

It will not be long before trips of this sort will be greatly extended. A prize has been offered for the first transpacific flight. British planes have flown from England by way of Cairo to India. An aërial pathway from Europe to Australia has been traversed. Plans are under way for a round-the-world race and a committee has started to lay out the route, pick out landing-places and referees and make the other necessary arrangements for such a venture.

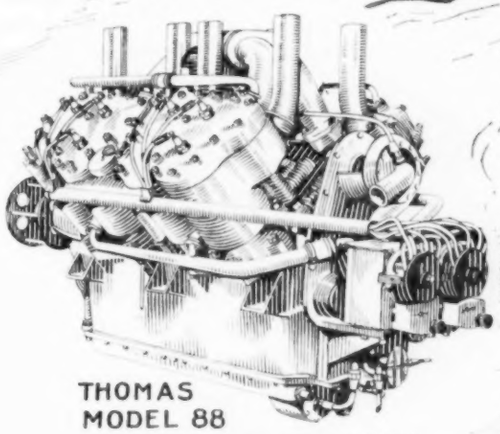
It is interesting to compare the results of the New York-Toronto air race with the automobile race held at Sheepshead Bay a few weeks later. In the first case the conditions were just about as bad as they could possibly be. Severe storms were encountered and two of the landing-fields, besides being small, were in bad condition. At Sheepshead Bay, on the contrary, the weather was perfect, the track the equal of any in the world and the cars on edge after days of careful tuning. But look at the results. The airplanes made better speed over a longer distance; there were no serious accidents except a broken arm sustained by a pilot who wrecked his machine to prevent running into a crowd which had broken the police lines, and nearly 60 per cent of the contestants finished the race. By contrast, one car broke a steering connection and rolled over, its occupants escaping by a miracle, and another caught fire and was only stopped after the driver and mechanic had been severely burned. The percentage of finishers was less than 50. Considering the relative age of the two sports, if one chooses to call them sports, the comparison seems more favorable to the airplane than ever.

Reliability is further demonstrated by several hundred-per cent months in the records of the New York-Washington aërial mail service which has been in satisfactory operation over a year. If all our mail were handled as promptly, some of us would begin to believe



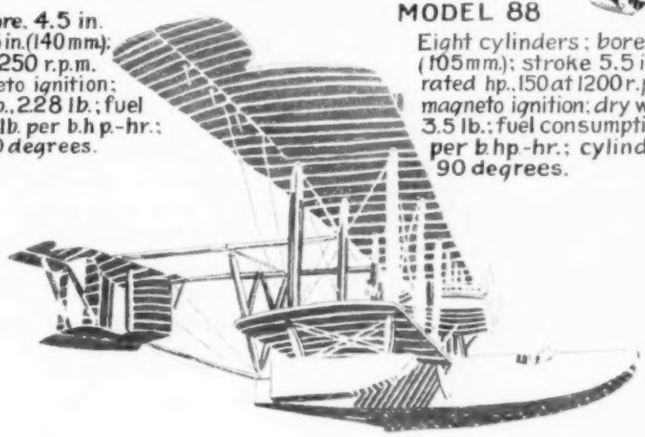
STURTEVANT MODEL 5-A-4 1/2

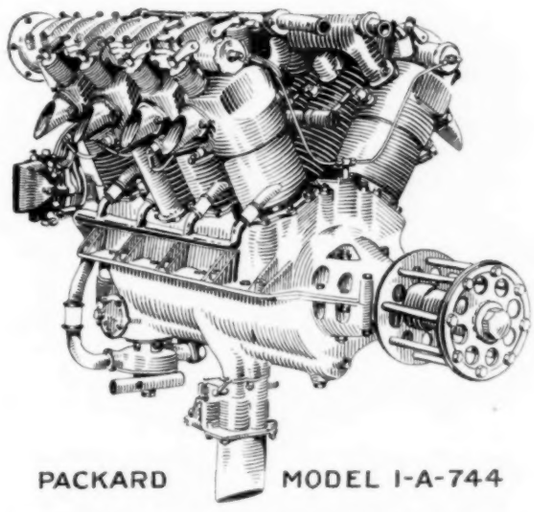
Eight cylinders; bore, 4.5 in. (114mm); stroke 5.5 in. (140mm); rated hp. 210 at 2250 r.p.m. (crankshaft); magneto ignition; dry weight per hp., 2.28 lb.; fuel consumption, 0.55 lb. per b.h.p.-hr.; cylinder angle, 90 degrees.



THOMAS MODEL 88

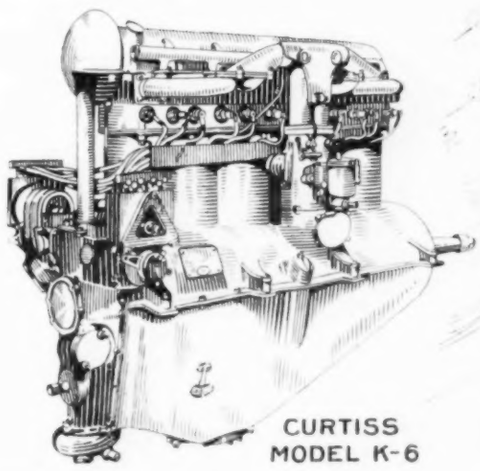
Eight cylinders; bore, 4.125 in. (105mm.); stroke 5.5 in. (140mm); rated hp., 150 at 1200 r.p.m. (propeller); magneto ignition; dry weight per hp, 3.5 lb.; fuel consumption, 0.59 lb. per b.hp.-hr.; cylinder angle, 90 degrees.





PACKARD MODEL I-A-744

Eight cylinders; bore, 4.75 in. (121 mm.); stroke, 5.25 in. (133 mm.); rated h.p., 160 at 1525 r.p.m.; battery ignition; dry weight per hp., 3.5 lb.; fuel consumption, 0.52 lb. per b. hp.-hr.; cylinder angle, 60 degrees.



CURTISS MODEL K-6

Six cylinders; bore, 4.5 in. (114mm); stroke, 6 in. (152 mm.); rated hp., 200 at 1600 r.p.m.; magneto ignition; dry weight per hp., 2.1 lb.; fuel consumption, 0.55 lb. per b. hp.-hr.

By B. Z. Reiter

in the imminence of the millennium. The newer branches of the aërial mail have not quite reached this standard but they are rapidly approaching it.

Freight-carrying by airplane does not look very practical as yet, and perhaps never will, but, speaking generally, we are not in so much of a hurry for freight as we are for some other things. Passenger carrying is undoubtedly coming. During the war British statesmen made many safe and speedy trips between London and Paris in a De Haviland plane with an inclosed body. This special de luxe service has been succeeded by a regular passenger-carrying line operating on schedule between the two cities. The Germans are doing the same thing with Zeppelins which even carry the passengers' baggage, while other lines in England, Germany and France will soon be in operation.

In America we lag behind as usual, but one big passenger carrier has made a successful flight from west of the Mississippi River to New York and Washington and many others will probably have been made before this article is published. The greatest handicap just now seems to be the lack of suitable landing-fields in all parts of the country.

The recent offer of a big engineering concern to the British Government of huge rigid dirigibles with a 70-ton carrying capacity and a 6,000-mile cruising radius makes one wonder how soon the fanciful transatlantic trip described in Kipling's story, "With the Night Mail," will be commonplace realities. They may come sooner than we think and prove Kipling and Jules Verne more prophets than visionaries.

The Field for Employment Management

BY ENTROPY

During the height of the war almost every manufacturer of any considerable size opened an office which he called the "Employment Office." In some cases it was a real and important part of the organization, but in too many it was merely a hiring office established in imitation of the real thing but performing very few of its functions. Very naturally, however, all the men engaged in this work called themselves employment managers. Many of them would be glad to take on their old jobs today if they could get them. That is, there are many more men who have had the title than there are filling such jobs today.

Does that mean that employment management is a bubble that has burst? Is there any object in a young man trying to make it his life work? My guess to the second question is: Yes. Almost every thing has its ups and downs, and nearly every good thing has been hurt at some time by people who were trying to be helpful. Scientific management was one that suffered from people who saw a chance to coin money but who did not grasp the fundamentals of the profession. It has weathered the storm and a great deal of very good scientific management is being done under the name of industrial engineering, which name really describes the work better than the one with which it was christened. In the same way employment management is suffering today for the sins of imitators who do not see the kernel in the thing they imitate.

The rush is over to all appearances. Scouting for help is not likely to again be an appreciable part of the employment function for some time. Polite stealing of help, big advertisements and all that goes with it have sunk out of sight. From now on it looks as though the function of employment management is the legitimate one of a more or less scientific selection of help and their careful and thorough training for the jobs they are to do and then making them content with the jobs, but not content to make little of them. It really seems as though the future holds out more that is worth while in employment management than the past. That is, it seems as though the work of industrial relations, of which employment management is a part, might become a very important factor in the cost of production and it certainly looks as though cost of production was again to become a very important part of business, where perhaps sales was the most important for a time and where getting materials and workmen was the most vital for another period. That is, we are likely to run into a period of competition in which every effort to produce efficiency is going to be of importance.

NEED OF "ESPRIT DE CORPS"

No one who has been around shops much can doubt for a moment that there is a great difference in the productivity of different shops and he is also impressed with the fact that the same men do vastly more work in some shops than they do in others. Some of this difference is in engineering, in methods of manufacture, in methods of handling, but more of it is in *esprit de corps*, and it is with that that the employee relations department is most keenly interested. This begins with the selection of men who have a fighting chance of making good in each job, then training them so as to bring out the best there is in them. It continues with seeing that they are placed under foremen who will make profitable use of the investment which has been put into them and so managing their relations to the firm that they will see that from a business point of view it is to their advantage to stick to it, and that from a social point of view they will want to stay. This is a rather large and comprehensive program but it takes the whole program to make an employment department which it is worth while to start at all. It is of course not necessary to do everything at once. In fact if it is put into effect too hurriedly there is danger that workmen will believe that it is some sort of a scheme to exploit them and they are likely to hold off and not co-operate as they would if it were put in gradually.

MUST ATTRACT GOOD WORKMAN

Thus it is made necessary that the employment manager be able to organize his work so as to make reasonably good selections where for the past few years he has merely had to attract a sufficient number of applicants. From now on he will probably get applicants enough so far as mere members go but he may have to artificially stimulate a flow of the quality he requires. Of course under competitive conditions it is very much worth while to man the shop with men who can and will gladly produce the largest amount of well-made goods. Such men are attracted by stability of employment, by a safe shop, by pleasant surroundings, by good wages, or wages proportionate to production and by association with their own kind of people.

Of course it is going to be necessary for each employment man to sell this idea to his superiors unless it happens to originate higher up, but it is certain that a great deal of the profit to be made in the future is going to be made in just this way and that is what most business is run for.

Small Machines for Building Optical Instruments

By J. V. HUNTER
Western Editor, *American Machinist*

The publicity given to the present-day tendency toward mass production with heavy machines is apt to cause us to overlook many items of interest in metal working of a different nature. The following article describes some miniature machines which have been built for use in the manufacture of delicate instruments.

AN INSTRUMENT which the occulist uses when he gazes into the interior of your eye is known as the ophthalmoscope or retinoscope. One of the makers of these instruments is the S. A. Rhodes Manufacturing Co., Chicago, Ill., in whose shop the interesting small machine tools which are here illustrated are to be found.

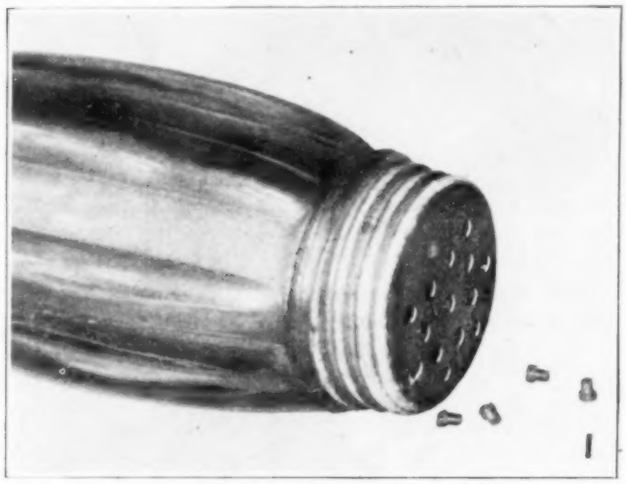


FIG. 1. SALT SHAKER AS CONTAINER FOR SMALL SCREWS

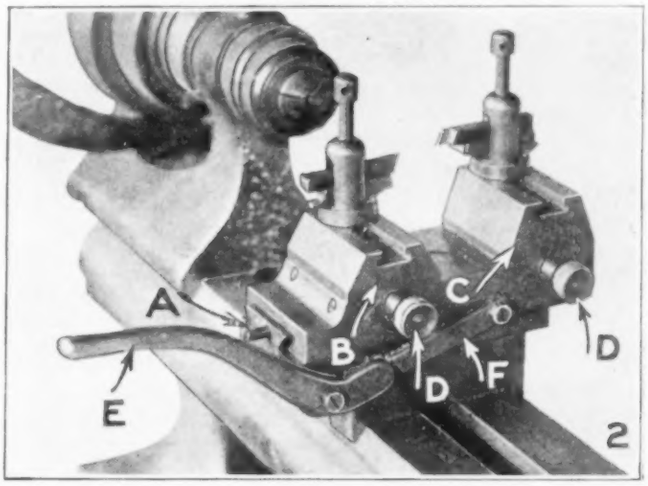


FIG. 2. CUT-OFF SLIDE FOR JEWELER'S LATHE

Some of the work done in the construction of these machines is similar to that done on small clocks, and one of the best evidences of the minute character of some parts is shown by the fact that a salt shaker is used for the storage of one size of small screws. The illustration, Fig. 1, shows it lying on its side with a few of the screws shaken out through the perforations. This method of handling is very convenient for the workman.

Mr. Rhodes has designed many small tools which better fit his shop for the character of work with which it is occupied. One of them is the cut-off slide, Fig. 2, which is provided as the tool carriage on a standard jewelers' lathe. Screw stops *A* that may be set for the depth of the cut are provided on both ends of the slide. Longitudinal adjustment of the two tools is provided by the compound slides *B* and *C*, which are adjusted by means of the thumb nuts *D*. In making a cut, the main slide is operated forward and back by means of the small hand lever *E* through the toggle link *F*.

A lens container to hold lenses of varying power in each of the openings around its rim is shown at *A* in Fig. 3. Outside of these openings a very narrow groove has been previously cut nearly through the entire thickness of the plate, leaving a thin flange of metal surrounding the hole. After putting a lens in place, the container disk is placed in the machine, as shown by the illustration, and the spinning head *B*, operated by the handle *C*, sets down the thin flange of metal, firmly holding the lens in the disk. At the same time the disk is pressed up against the spinning head by means of the hand lever D. The entire machine, including its base, is approximately $10\frac{3}{4}$ in. high and weighs $4\frac{1}{2}$ pounds.

The bench hand-press, Fig. 4, is one of the smaller machines constructed in the shop under consideration. It is used for punching out little parts, different dies being set in the bolster plate for different jobs. In the illustration, the machine is equipped with a riveting head for forcing small studs *A* into the flat steel springs *B*. The studs go in opposite sides of the two ends of the springs, and the recess *C* in the top of the extra bolster plate permits the spring in which one stud has already been inserted to lie flat. A small ejector is operated by the lever *D* to force the riveted stud out of the hole in the die. The body of the press is a single casting, the crankshaft bearings at the top being solid. The slide is dovetailed into the face of the column, and is provided with a gib which can be adjusted by setscrews. The link connecting the crankshaft with the slide is held by a screw on the eccentric stud turned on the end of the crankshaft, and it is attached to the slide by a stud riveted in place. The entire machine is $10\frac{1}{4}$ in. high and weighs 12 pounds.

A Milling Machine Weighing 6 Pounds

If the description of the masterpiece of this collection has been left for the last, it loses nothing of interest by contrast with that which has gone before.

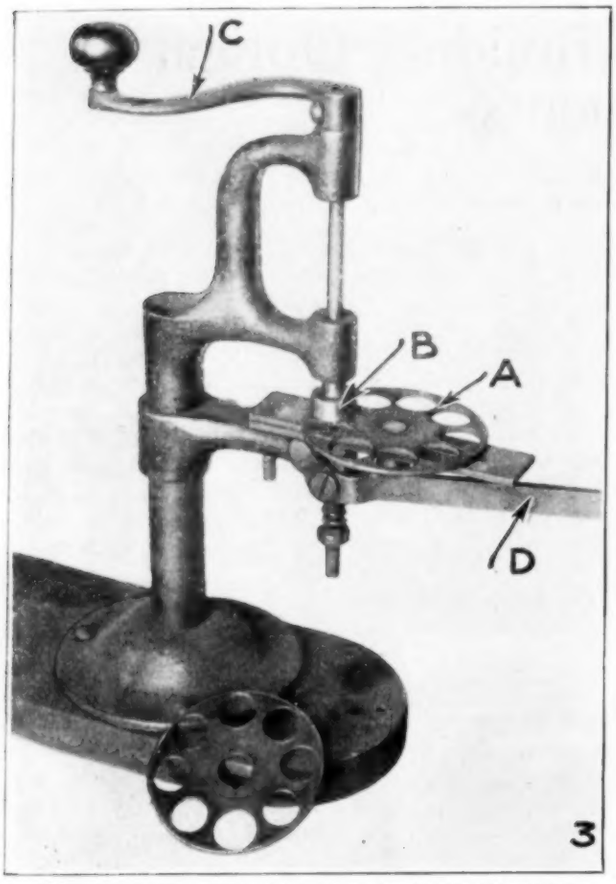


FIG. 3. SMALL SPINNING DEVICE FOR SECURING LENSES IN THEIR CONTAINERS

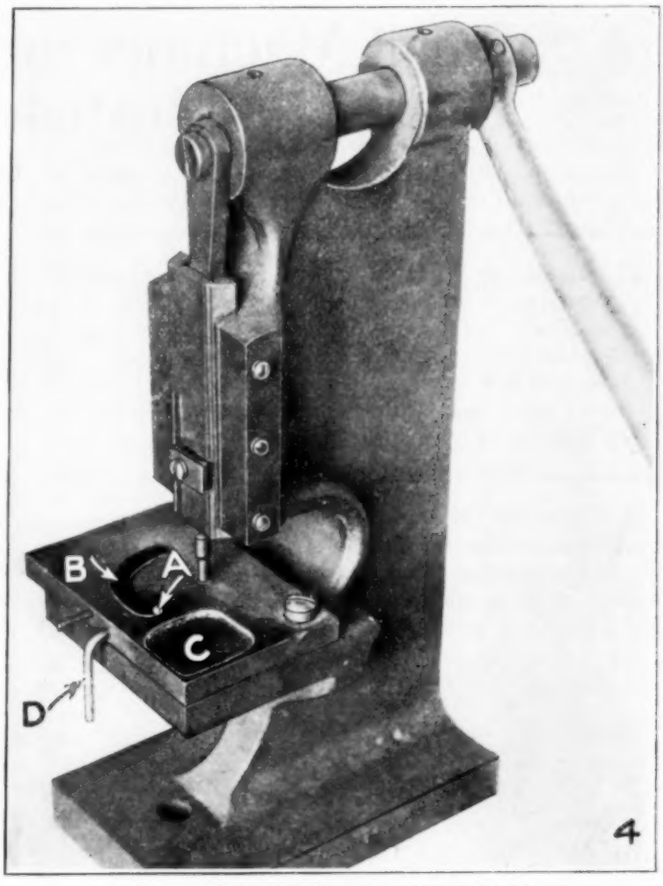


FIG. 4. 12-LB. PUNCH PRESS SET UP FOR A RIVETING JOB

The milling machine illustrated in Fig. 5 was designed and built for machining small parts that can be held in a chuck. At the rear of the machine stands a 6-in. scale *A*, indicating the height of the machine from its base to the center of the spindle. The complete machine,

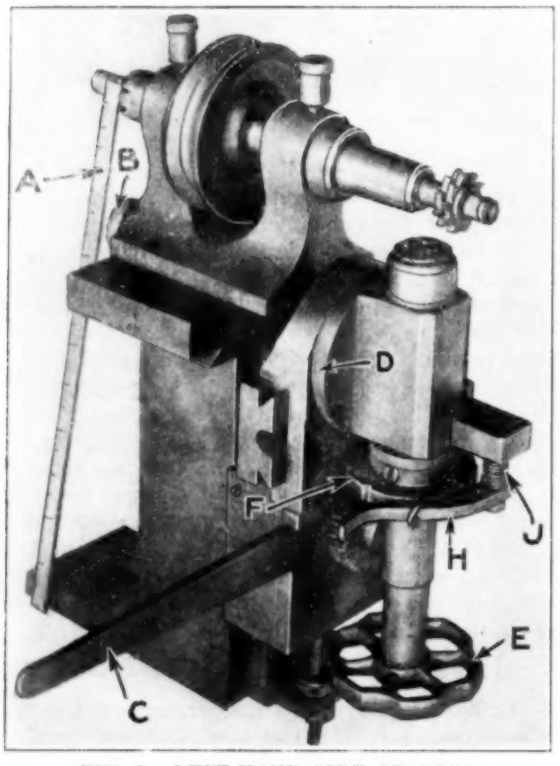


FIG. 5. LEFT-HAND SIDE OF 6-LB. MILLING MACHINE

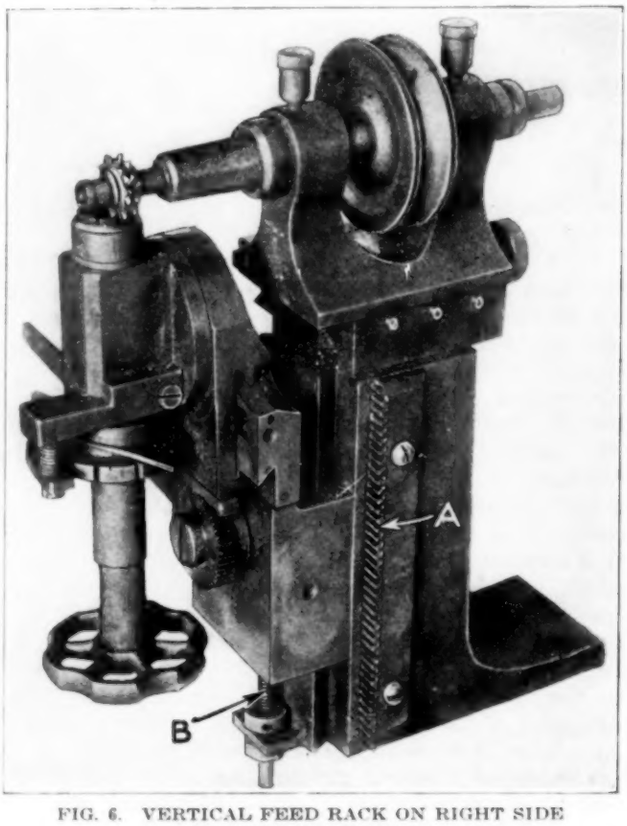


FIG. 6. VERTICAL FEED RACK ON RIGHT SIDE OF MILLING MACHINE

as shown here, weighs an even 6 pounds. Its column is provided with a foot by which it can be bolted to a table, and it carries a spindle head which can be adjusted in or out by means of a thumb nut *B* on its rear side in order to position the cutter with respect to the work. The spindle is driven by a round belt on a single grooved pulley. It is mounted in steel bearings, and the rear bearing is tapered and may be adjusted by means of the nut on the rear of the spindle to take up end play. Small cup oilers are located on the top of each bearing.

The knee slides vertically on ways on the face of the column and has an adjustable gib. It was originally provided with a vertical feed, with a hand lever operating a pinion in the rack *A*, Fig. 6, but this has been temporarily removed while the machine is in service on its present job. A screw stop *B*, provided with adjusting nuts, is arranged so that the knee can be set at any desired height.

The saddle slides horizontally on the ways of the knee. It is provided with a rack-and-pinion feed operated by the lever *C*, Fig. 5, for moving the work under the cutter.

The rise on the saddle may be swiveled in a vertical plane, and the graduations can be noted on the circular portion *D* of the base. By means of a nut on the back of the saddle, the vise is clamped in position after it has been set at the desired angle. The vise is fitted with a spring collet that is drawn down by the handle *E*. The spindle of the collet can be rotated for indexing the work when multiple slotting the heads of screws. For this purpose it is provided with an index flange *F*, in which notches have been cut. The flange is indexed by the trigger *H*, which normally is held firmly against the flange by means of a spring *J*.

To enumerate and describe the different parts on this milling machine makes it seem almost as large and complicated as a full sized machine, such as a No. 3, but the difference in size can be illustrated no more strikingly than by saying that the crown of a man's hat placed over the little machine will entirely cover and hide it.

Marking Tools by Etching

By E. A. Dixie

About the only way to mark hardened tools satisfactorily is by the etching process. They can be marked by an electric instrument which fuses the surface but the marks made by this instrument are irregular, with little blobs of metal along the lines, and on very fine tools there is a possibility that the intense heat, at least 3,000 deg. F. at the point where the etching is done, may cause a distortion. By the chemical process of etching, the steel is eroded by an acid, the lines are as uniform as the lines drawn on the work by the etcher, there are no blobs of metal at the sides of the lines and the amount of heat generated by the chemical action is so slight that it cannot injure the most delicate instrument. Further, with the exception of the eyeglass, the entire outfit can be bought for less than half a dollar.

In Fig. 1 all the essentials for etching are shown. They comprise a *glass stoppered* bottle of 25 per cent nitric acid; a small can of Asphaltum varnish; a fountain pen or medicine dropper; a coil of wax fillet such as patternmakers use; an etching point; and an ordinary toolmaker's eyeglass. Besides the outfit shown the etcher should have two or three small brushes, such as one

FIG. 1. THE ESSENTIALS FOR ETCHING

can even now buy at the druggist's for five cents each, and a squirt can of kerosene or gasoline. The etching point shown was made from a small darning needle, and is for small work. The etcher should have several points if his work is varied. Fig. 2 shows three types. Note the bent end of the thin point. This is one of the handiest points, and not well known. If it is made from a thin needle, so that it is springy, very fine script can be written with it in the etching resist.

The steel to be etched should be clean and bright, although this is not absolutely necessary. It is coated with a thin coat of the asphalt varnish. If the varnish in the can is too thick it can be thinned with a very little gasoline or kerosene, of which gasoline is the better because it dries more quickly. The tool can then be left to dry slowly or drying of the varnish may be accelerated by warming the tool slightly. From time to time the etcher should test the dryness of the varnish with the tip of his finger, applied at some point on the surface where he does not intend to scratch with the etching point. When the varnish has become dry enough so that it will not stick to the finger, that is to say, *beyond* the "tacky" stage, it is ready for the next operation.

With the tip of the finger, powdered chalk, talcum or any other white powder is smeared in a very thin coat over the varnish. This forms a "ground" for the etcher's *pencil* sketch of what he wishes on the tool. He then takes a soft lead pencil and sketches in the words or figures *very lightly*, being exceedingly careful *not to cut through the soft varnish* which protects the steel, for every part of the steel which is exposed will be attacked by the acid.

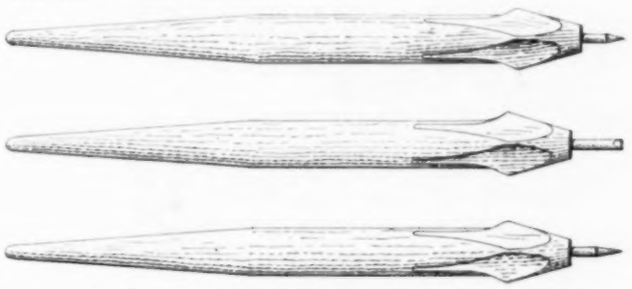


FIG. 2. THREE TYPES OF ETCHING POINTS

The various steps are shown in Fig. 3, beginning at the left. The samples shown were prepared especially for this article and were purposely etched large for reproduction. They are patternmakers' chisels, the left one 1½ in. and the others 1¼ in. wide. *A* shows the chisel coated with varnish, dusted with chalk and the letters H.R. sketched in with a "B" pencil.

The etcher now takes the most suitable etching point and scratches the outlines of the letters or design right through the varnish so that the steel is exposed as shown by the letter H on chisel *B*. He then, with the glass, examines the outline carefully to see whether or not it needs correcting anywhere. Correction can usually be done better before the letters are fully blocked out as one can often make the whole job look all right by "doctoring" two or three of the letters next the one on which the slip has been made. Having decided that the outline is to his liking he proceeds to block the letters out as shown by the letter R and the vinculum of the H on chisel *B*. The work is again examined for mistakes and corrections made.

Being satisfied with the work the etcher takes a soft cloth or one of the small brushes and dusts off all the chalk. If this is left on it causes the acid to boil and much of its strength is wasted on eating the chalk instead of the steel. Having removed the chalk the etcher takes a piece of the wax fillet long enough to surround the words or diagram and presses it firmly down onto the face of the work, being careful that it makes a tight dam around the scratched part so that the acid will not run beyond the varnished surface. This stage of the work is shown by chisel *C*. The work is now ready for the application of the nitric acid.

The work is adjusted in a level position, with the face up. With the medicine dropper the etcher drops a little of the acid on the scratched part of the tool within the wax dam, being careful to see that all of the exposed surface of the steel is wet with the acid. Almost immediately small bubbles will form in the acid along the lines scratched on the steel. Where the lines are very fine the bubbles will be very small and close together. As they prevent more acid from reaching the scratched lines they should be removed. This is easily done by sucking up the acid with the dropper and then dropping it again, being very careful not to scratch away any of the varnish. On work which has very fine lines it will be necesasry to repeat this operation several times during the etching process. The acid will eat in several thousandths deep in a few minutes, the depth and time depending upon the strength of the acid and the steel being etched. The etcher should remember that for this work concentrated acid does not work so rapidly as diluted acid. I have no data at present covering nitric acid, but with sulphuric the mixture which acts quickest is about 11 or 12 per cent. The same is also true of hydrochloric.

Having "bitten in" the design to a sufficient depth the etcher removes the excess acid with the dropper and then takes the job to the sink to wash the remaining acid out. He should be careful not to allow any of the acid to drip or run over other bright work or other bright portions of the job as it will at once make a black stain wherever it touches.

After washing the work thoroughly with water the wax is removed and the varnish washed off with a rag wet with gasoline or kerosene. Work which cannot be washed in water (for example a fine toolmakers' protractor) for fear of rusting its parts should be washed

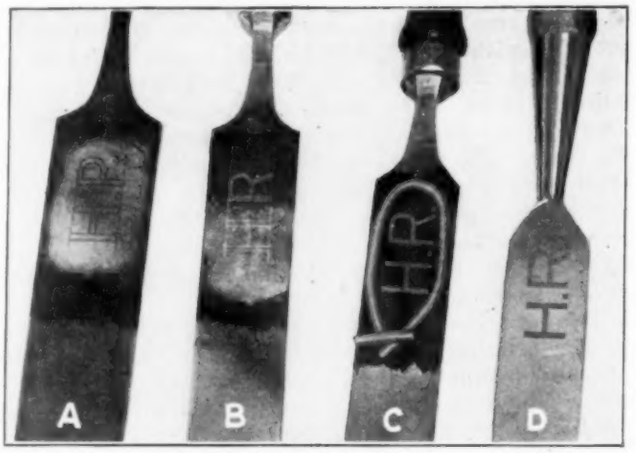


FIG. 3. SUCCESSIVE OPERATIONS IN ETCHING

with the medicine dropper, using strong sal soda water, as the sal soda neutralizes the acid. The finished job is shown by *D*.

There are a few things that the beginner should remember: Do not attempt to etch nickelplated tools with nitric acid as it has little effect on nickel. If you want to etch nickel, get the druggist to mix you some "aqua regia" which is a mixture of nitric and hydrochloric acids.

Be careful not to scratch the varnish off anywhere except where you wish to etch, but if you do, or your etching point slips, cover the defect with a little varnish and let it dry as described, before going on with the work. Never let the varnish harden dead hard before starting to scratch the design, because hard dry varnish has a most unpleasant habit of jumping off in flakes, leaving a line which will etch unevenly.

The varnish should be spread on *thinly* but *evenly*, and if very fine lines are to be etched, the varnish should be *especially thin*.

Phonograph needles make good etching points for some work, but are too stiff for other kinds. The needle shown in Fig. 1 has the extreme tip bent over at about a right angle, the point extending about $\frac{1}{4}$ in. from the body of the needle and works well on script.

Besides etching designs on work the writer has used the process for cutting out springs of varied shapes from hardened flat spring steel stock, and for "drilling" holes in hard stock such as old hacksaw blades. When either of these jobs is in hand the shape of the spring or the location and size of the hole is laid out on *both* sides of the stock which has previously been *varnished all over*. The work is then put in a shallow glass, earthenware or lead (nitric acid does not attack lead) receptacle with the acid covering it. The etcher should see that the job is so placed that the acid can get at the design on both sides. The beginner should experiment on pieces of old hacksaws until he becomes familiar with the work and the depths of etch he gets with various lengths of exposure to the erosive action of the acid. At the start do not allow the acid to remain longer than say five minutes on the work. It can be examined with the glass after washing in clean water and if not deep enough it can be subjected to the acid again *if the varnish is not injured*.

Do not have fine bright tools close to an etching operation as the gas bubbles formed on the work often throw microscopic drops of acid when they burst, and these, falling on bright work, will make little black spots like fly specks.

Developing and Holding Foreign Trade

For some time prior to the war, the foreign trade of the United States showed a healthy increase; but the great conflict, in converging the thought and energies of Europe upon war and its necessities, gradually converted the American nation into the temporary workshop and supply house of the world. In an endeavor to meet this unprecedented demand for its products and manufactures of every description, with the added strain of becoming in 1917 an active belligerent in the conflict, there have been invested in the United States since 1914, in new productive enterprises and machinery, more than six billions of dollars. If these new forces, in addition to those in operation before the war, are now to be kept in productive activity, it becomes incumbent upon the United States to develop foreign outlets to take over the surplus to be expected from this production.

THE POSITION of this country during the war was an extremely difficult one. Not only had we become for the time being the banker and supply house of the world, but the cataclysm of a world war with its imperative and immediate demands had placed almost insuperable obstacles in the way of our adequately answering this universal demand upon us.

Now, however, that peace is again established the country appears to be slowly awakening to a realization that no nation of the world has ever had thrust upon it the foreign trade possibilities which are now opened up before us. Before the world conflict Germany and England were impelled by economic forces to develop external markets for their surplus products, inasmuch as their productive machinery was producing a surplus above that required for home consumption. The United States, on the other hand, to the time of the outbreak of the war had been growing with such tremendous strides that any preparation for foreign trade was soon overtaken by the home demand.

Now, however, with the termination of the war the productive capacity of all Europe will again be diverted to the interests of peace and competition for world markets must of necessity become keen. In this crisis if this country is to keep in productive activity the vast new forces which were created during the war to enable us to answer the demand of the world upon us for our products we have no alternative but to enter actively into this competition in an endeavor to develop permanent markets for the surplus which these forces must inevitably create.

With a view to meeting this competition the highest intelligence that can be spared from our various lines of business interested in foreign development should visit South America. This preliminary survey should not be left to salesmen. It must be remembered that in South America there are today approximately sixty-five millions of people. The field is a vast one and has heretofore been intensively cultivated by Europe.

An axiom in foreign trade is that "Business follows Investment." The vast foreign commerce transacted before the war between Europe and South America was based primarily upon Europe's investment in South American bonds and public utilities of every description. The opportunities for such further investment are extensive and should now be taken advantage of by American capital.

Within the past few years the great packing interests in this country have established large plants in Brazil, in Uruguay and in the Argentine, and American mining companies are constantly augmenting their holdings in Chile and along the West Coast. Practically every line of American business effort is now represented in the various South American countries and the constant inquiries we receive indicate an ever-increasing interest on the part of American business men, not only in South American trade development, but likewise in the possibilities of the southern continent for the investment of capital. The measure of our ability, therefore, to retain the foreign business which abnormal world conditions have temporarily diverted to this country will be the extent to which we intelligently cultivate the trade of our new acquaintances. If we will now bring to bear upon our efforts at reconstruction and the development of a permanent foreign trade that same intelligence and energy which we devoted intensively to the prosecution of the war our efforts in this direction should meet with a like measure of success. We must remember, however, that the confidence of foreign merchants can be inspired only by properly pricing our goods for export; by according time where the credit standing of foreign client so warrants; by scrupulously adhering to instructions regarding packing and billing; by avoiding substitution without securing the consent of client thereto, and in general through endeavoring to impress upon our foreign friends by the manner in which we fill their orders our desire to develop a permanent foreign trade by applying to the business with which they favor us those same high principles of scrupulous business probity which have built up the vast domestic commerce of this country.

How to Hold Foreign Trade

The development of a permanent foreign trade requires as much care and attention to holding business once secured as it does to its original development, and as competition increases the truth of this assertion becomes more apparent. As an aid to the development and retention of foreign business the following suggestions are offered:

First. That correspondence be in the language of the country in which client is located; that is, if the customer is a subject or citizen of that country, and if it is not known that he is familiar with English.

There is likewise a prevalent complaint throughout South America as to apparent laxity in our methods of correspondence. It must be remembered that South American clients are many thousands of miles from their sources of supply, and inquiries should be answered immediately and in detail. If an order is received and conditions render impossible immediate

manufacture this information should be communicated immediately to foreign client, and if delay in shipping is occasioned for any reason, notice to this effect by cable or letter will be appreciated. In other words, it is advisable to keep foreign clients constantly advised as to the progress that is being made with their orders. In fact, the opportunity of corresponding in this manner should be taken advantage of, as in addition to placating a customer by keeping him informed there is an element of courtesy involved which is appreciated.

SECOND. In selling endeavor to give the foreign client what he wants, and not just what you wish to sell him. The application of this principle is the basis upon which was constructed the vast foreign trade of England, France and Germany before the war.

THIRD. Conform strictly to the instructions of customers as to packing, billing and the preparation of documents. It is well to assume that the foreign merchant is probably more familiar with the requirements of his own government and the customs or habits of his own trade than we can possibly be.

FOURTH. Investigate the credit standing of those with whom you contemplate establishing relations.

PACKING

A subject calling for close and intelligent study in foreign trade is the packing of shipments. On the kind and manner of packing depends the arrival of shipment at destination, the amount of rail and ocean freight charged for transportation and the amount of customs duties imposed. Duties are frequently affected, sometimes quite seriously, by faulty packing or by the use of a container or a covering which brings the contents under a classification of tariff higher than would be the case were a different kind or method of packing used.

Packing should be considered with three different aspects in view: the preservation of the merchandise, economy in duties to be imposed by the foreign custom house, and economy in the space occupied by the packed shipment. In connection with this subject it should be remembered that in addition to the severe and varied handlings of shipments incident to being placed aboard vessel in this country they are subjected to considerable additional handling in the foreign port, and to interior points in many of the South American countries transportation from the coast is by means of river steamer, raft and mule. Generally speaking, bulky packages should be avoided when this is possible, it being far better to divide the shipment into two or perhaps three parts.

Packing should be as light as possible, consistent, however, with the strength necessary to carry to destination, intact and in proper condition, the particular class of merchandise shipped, having in mind the numerous exceedingly rough handlings and many changes to which all foreign shipments are subjected.

If, to answer this purpose, a heavier case with metal straps and bands is necessary, then by all means the packing should be done in this manner.

When a foreign buyer suggests that his order be packed in a certain way, it is possible that his request is based upon the rules of the custom house regarding the imposition of duties. As an illustration of this point, shovels when imported into Chile pay no duty if they come into the country complete. If, however, the handles and the metal bases come packed separately duties are imposed upon each. It is evident that a shipment of shovels sent forward in this divided manner will entail upon the part of foreign purchaser the payment of the duties imposed resulting in dissatisfaction and complaint.

When merchandise is forwarded to a distributing agent, goods for different consignees should not be placed in the same case unless instructions have been received to this effect, because, when so packed, delivery to any one consignee renders necessary the payment of all duties and the release from the customs of the entire shipment.

Where various packages make up a shipment to one consignee, it is advisable to have the same identifying mark appear on all. Consecutive numbers should be used to distinguish the various packages. To illustrate:—If a shipment is prepared for Juan Silveira & Co., Buenos Aires, the identifying mark would probably be:

J. S. & CO
BAIRES

If there were two bales or boxes, they would be marked:

J. S. & CO	J. S. & CO
BAIRES	BAIRES
Number 1	Number 2

and these marks and identifying numbers should appear on the consular invoices, the bills of lading, and on the commercial invoices, with the contents of each, and with the net and gross weights in kilos and the measurements in inches or in the metric system.

The principal port in the Argentine is Buenos Aires. Sailings are maintained from New York, Mobile and New Orleans. Shipments require consular invoice written in Spanish. Cases, bales and packages may be marked either with a stencil or brush. It is likewise necessary that cases, bales and packages bear the shipping mark and number as well as the name of steamer by which goods are shipped. This should appear on two sides. The observance of this rule will facilitate release through foreign customs.

PACKING AND IMPORT DUTIES

In connection with packing it is important to note that upon imports into most South American countries the duty is levied on the gross weight, meaning thereby the total weight less rough wooden or other container.

When container is of a nature the duty on which may be higher than that of its contents, separate duties are levied thereon.

Merchandise of various kinds, if packed in the same case or package, runs the risk of being assessed at the rate of the highest taxed article therein. Furthermore, if the description of the goods in declaration is such as to render doubtful the classification under which the shipment should be placed, foreign customs authorities always classify under the highest rating.

In practically all of our large cities it will be found that consuls of the various South American countries have offices, and before packing shipments, it is advisable for exporters to find out whether the duties to be imposed in the South American country of destination are calculated on the net, legal or gross weight. The net weight indicates the weight of the article itself, exclusive of its packing or wrapping. The legal weight signifies the weight of the article plus

its immediate covering. For example, on merchandise packed in cardboard boxes with perhaps a half gross or more of these boxes in a case, the legal weight is the weight of the merchandise plus the cardboard container, but not the weight of the outside wooden case. Gross weight means the total weight of the merchandise including the outside container.

A recent shipment of neckwear to Chile was refused by the consignee on the ground that the ties came packed in fancy cardboard boxes, one tie in a box, the container weighing three times as much as the tie itself. The duties in this instance were imposed by "legal weight," and had the merchant accepted shipment it will be seen that for each tie he would have been taxed four times, viz.: the duty on the tie, plus the duty at the same rate on the cardboard box, figured on its weight.

LABELS ON MERCHANDISE

Labels on the merchandise itself should be in Portuguese on shipments to Brazil, and in Spanish on shipments to other South American countries. This is an important detail to keep in mind, as labels in English mean little or nothing to the general public in South America.

These observations should be sufficient to indicate the necessity for the exercise of extreme care, if the interests of foreign clients are to be protected.

—THE NATIONAL CITY BANK OF NEW YORK.

Measure of Damages for Loss Caused By Negligence In Repairing Machinery

BY LESLIE CHILDS

It may be stated broadly that where one holds himself out as a machinist, and contracts to repair or rebuild machinery, he is presumed to be competent, and to realize the danger likely to result from negligent or unskilled work. And if the work is done in a careless or negligent manner, which results in future damage to the machinery, he will be liable for such damage if it was directly caused by his unskillful work.

However the measure of damages for losses caused by negligence in repairing machinery is controlled by certain well-defined limitations. And, as noted above, the machinist is only liable for loss caused by his negligence in repairing, which was within the contemplation of the parties when the contract for repairing was made. In other words he is only liable for loss which proximately resulted from his unskillful work.

The law books contain many cases illustrating the application of this rule in measuring damages for the breach of contracts of this kind. And it appears probable that the examination of a particular case of this kind would be of more profit than any number of abstract or general statements of rules. For this purpose the recent case of Moorhead vs. Arkansas Machine and Boiler Works, 205 S. W. 980 is of special interest, the facts involved being in the main as follows:

W. H. Moorhead employed the Arkansas Machine and Boiler Works to make certain repairs upon a steam engine. The repairs were made and Moorhead proceeded to use the engine, whereupon it wrecked itself.

Thereafter Moorhead brought an action for damages against the Arkansas Machine and Boiler Works for the loss caused by the destruction of the engine. This action was based upon the contention that the destruction of the engine was caused by the negligence of the other in making the repairs. In specifying the negligence complained of, the following language was used:

The Arkansas Machine and Boiler Works in doing the work failed "to drill a sufficient number of holes of a sufficient depth, and in not putting in a sufficient number of capscrews, and in not putting in properly the capscrews that were put in to hold the broken piece in place, in that the holes were not drilled into the broken piece as they should have been, but were only made like shallow dents, against which the capscrews were placed, but which allowed the broken piece to slip upward, thereby causing the flywheel shaft to jump out of its bearings and destroying the engine almost completely."

It appears that Moorhead used the engine for the purpose of pumping water for a rice crop, and that after the mishap to the engine he was put to considerable delay in getting another. So in his action he asked damages for both the destruction of the engine and for loss to the rice crop caused by the delay in getting another engine.

The Arkansas Machine and Boiler Works on the other hand contended that the measure of damages was the difference in value of the work as done, and its value if it had been done properly. They introduced testimony to show that the total charge for the repairs was but $11, and insisted that the measure of damages should be taken with this in view.

The trial in the lower court resulted in a judgment for $150 in favor of Moorhead for damage to the engine, but the court eliminated the question of damage for injury to the crop. From this judgment the Arkansas Machine and Boiler Works prosecuted an appeal to the Supreme Court, where in passing upon the record it was said among other things:

"One holding himself out as a machinist and accepting employment to repair a steam engine is presumed to know the nature and the character of the work he is about to do, and the results likely to follow a negligent performance of his work, and is, therefore, liable for the damage proximately resulting from a negligent and unskilful performance of his work . . . ."

The Supreme Court thereupon affirmed the judgment in favor of Moorhead rendered in the lower court. Holding that on the record he was entitled to damages for the destruction of the engine; this because such damage must have been within the contemplation of the parties when the contract was made.

The court, however, approved the acts of the lower court in eliminating the question of Moorhead recovering for damages to the rice crop, alleged to have been caused by the delay in getting another engine. This for the reason that such damages were too remote, and therefore were not in the minds of the parties when the contract for repairs was entered into.

The opinion in the above case is supported by the great weight of authority on the question involved and illustrates in a clear manner the limitations upon the liability of a machinist for negligence in repairing machinery. Holding that he is bound to do the work in a competent, workmanlike manner, being liable for any damage proximately resulting from his negligence; yet he cannot be made liable for remote damages, or those arising indirectly from his negligence, which were not in mind or contemplation of the parties when the contract was made.

Temperature Conversion Tables

By Albert Sauveur

—459.4 to 0

C.		F.	
—273	**—459.4**		
—268	**—450**		
—262	**—440**		
—257	**—430**		
—251	**—420**		
—246	**—410**		
—240	**—400**		
—234	**—390**		
—229	**—380**		
—223	**—370**		
—218	**—360**		
—212	**—350**		
—207	**—340**		
—201	**—330**		
—196	**—320**		
—190	**—310**		
—184	**—300**		
—179	**—290**		
—173	**—280**		
—169	**—273**	—459.4	
—168	**—270**	—454	
—162	**—260**	—436	
—157	**—250**	—418	
—151	**—240**	—400	
—146	**—230**	—382	
—140	**—220**	—364	
—134	**—210**	—346	
—129	**—200**	—328	
—123	**—190**	—310	
—118	**—180**	—292	
—112	**—170**	—274	
—107	**—160**	—256	
—101	**—150**	—238	
— 95.6	**—140**	—220	
— 90.0	**—130**	—202	
— 84.4	**—120**	—184	
— 78.9	**—110**	—166	
— 73.3	**—100**	—148	
— 67.8	**— 90**	—130	
— 62.2	**— 80**	—112	
— 56.7	**— 70**	— 94	
— 51.1	**— 60**	— 76	
— 45.6	**— 50**	— 58	
— 40.0	**— 40**	— 40	
— 34.4	**— 30**	— 22	
— 28.9	**— 20**	— 4	
— 23.3	**— 10**	14	
— 17.8	**0**	32	

0 to 100

C.		F.	C.		F.
—17.8	**0**	32	10.0	**50**	122.0
—17.2	**1**	33.8	10.6	**51**	123.8
—16.7	**2**	35.6	11.1	**52**	125.6
—16.1	**3**	37.4	11.7	**53**	127.4
—15.6	**4**	39.2	12.2	**54**	129.2
—15.0	**5**	41.0	12.8	**55**	131.0
—14.4	**6**	42.8	13.3	**56**	132.8
—13.9	**7**	44.6	13.9	**57**	134.6
—13.3	**8**	46.4	14.4	**58**	136.4
—12.8	**9**	48.2	15.0	**59**	138.2
—12.2	**10**	50.0	15.6	**60**	140.0
—11.7	**11**	51.8	16.1	**61**	141.8
—11.1	**12**	53.6	16.7	**62**	143.6
—10.6	**13**	55.4	17.2	**63**	145.4
—10.0	**14**	57.2	17.8	**64**	147.2
— 9.44	**15**	59.0	18.3	**65**	149.0
— 8.89	**16**	61.8	18.9	**66**	150.8
— 8.33	**17**	63.6	19.4	**67**	152.6
— 7.78	**18**	65.4	20.0	**68**	154.4
— 7.22	**19**	67.2	20.6	**69**	156.2
— 6.67	**20**	68.0	21.1	**70**	158.0
— 6.11	**21**	69.8	21.7	**71**	159.8
— 5.56	**22**	71.6	22.2	**72**	161.6
— 5.00	**23**	73.4	22.8	**73**	163.4
— 4.44	**24**	75.2	23.3	**74**	165.2
— 3.89	**25**	77.0	23.9	**75**	167.0
— 3.33	**26**	78.8	24.4	**76**	168.8
— 2.78	**27**	80.6	25.0	**77**	170.6
— 2.22	**28**	82.4	25.6	**78**	172.4
— 1.67	**29**	84.2	26.1	**79**	174.2
— 1.11	**30**	86.0	26.7	**80**	176.0
— 0.56	**31**	87.8	27.2	**81**	177.8
0	**32**	89.6	27.8	**82**	179.6
0.56	**33**	91.4	28.3	**83**	181.4
1.11	**34**	93.2	28.9	**84**	183.2
1.67	**35**	95.0	29.4	**85**	185.0
2.22	**36**	96.8	30.0	**86**	186.8
2.78	**37**	98.6	30.6	**87**	188.6
3.33	**38**	100.4	31.1	**88**	190.4
3.89	**39**	102.2	31.7	**89**	192.2
4.44	**40**	104.0	32.2	**90**	194.0
5.00	**41**	105.8	32.8	**91**	195.8
5.56	**42**	107.6	33.3	**92**	197.6
6.11	**43**	109.4	33.9	**93**	199.4
6.67	**44**	111.2	34.4	**94**	201.2
7.22	**45**	113.0	35.0	**95**	203.0
7.78	**46**	114.8	35.6	**96**	204.8
8.33	**47**	116.6	36.1	**97**	206.6
8.89	**48**	118.4	36.7	**98**	208.4
9.44	**49**	120.2	37.2	**99**	210.2
			37.8	**100**	212.0

100 to 1000

C.		F.	C.		F.
38	**100**	212	260	**500**	932
43	**110**	230	266	**510**	950
49	**120**	248	271	**520**	968
54	**130**	266	277	**530**	986
60	**140**	284	282	**540**	1004
66	**150**	302	288	**550**	1022
71	**160**	320	293	**560**	1040
77	**170**	338	299	**570**	1058
82	**180**	356	304	**580**	1076
88	**190**	374	310	**590**	1094
93	**200**	392	316	**600**	1112
99	**210**	410	321	**610**	1130
100	**212**	413	327	**620**	1148
104	**220**	428	332	**630**	1166
110	**230**	446	338	**640**	1184
116	**240**	464	343	**650**	1202
121	**250**	482	349	**660**	1220
127	**260**	500	354	**670**	1238
132	**270**	518	360	**680**	1256
138	**280**	536	366	**690**	1274
143	**290**	554	371	**700**	1292
149	**300**	572	377	**710**	1310
154	**310**	590	382	**720**	1328
160	**320**	608	388	**730**	1346
166	**330**	626	393	**740**	1364
171	**340**	644	399	**750**	1382
177	**350**	662	404	**760**	1400
182	**360**	680	410	**770**	1418
188	**370**	698	416	**780**	1436
193	**380**	716	421	**790**	1454
199	**390**	734	427	**800**	1472
204	**400**	752	432	**810**	1490
210	**410**	770	438	**820**	1508
216	**420**	788	443	**830**	1526
221	**430**	806	449	**840**	1544
227	**440**	824	454	**850**	1562
232	**450**	842	460	**860**	1580
238	**460**	860	466	**870**	1598
243	**470**	878	471	**880**	1616
249	**480**	896	477	**890**	1634
254	**490**	914	482	**900**	1652
			488	**910**	1670
			493	**920**	1688
			499	**930**	1706
			504	**940**	1724
			510	**950**	1742
			516	**960**	1760
			521	**970**	1778
			527	**980**	1796
			532	**990**	1814
			538	**1000**	1832

1000 to 2000

C.		F.	C.		F.
538	**1000**	1832	816	**1500**	2732
543	**1010**	1850	821	**1510**	2750
549	**1020**	1868	827	**1520**	2768
554	**1030**	1886	832	**1530**	2786
560	**1040**	1904	838	**1540**	2804
566	**1050**	1922	843	**1550**	2822
571	**1060**	1940	849	**1560**	2840
577	**1070**	1958	854	**1570**	2858
582	**1080**	1976	860	**1580**	2876
588	**1090**	1994	866	**1590**	2894
593	**1100**	2012	871	**1600**	2912
599	**1110**	2030	877	**1610**	2930
604	**1120**	2048	882	**1620**	2948
610	**1130**	2066	888	**1630**	2966
616	**1140**	2084	893	**1640**	2984
621	**1150**	2102	899	**1650**	3002
627	**1160**	2120	904	**1660**	3020
632	**1170**	2138	910	**1670**	3038
638	**1180**	2156	916	**1680**	3056
643	**1190**	2174	921	**1690**	3074
649	**1200**	2192	927	**1700**	3092
654	**1210**	2210	932	**1710**	3110
660	**1220**	2228	938	**1720**	3128
666	**1230**	2246	943	**1730**	3146
671	**1240**	2264	949	**1740**	3164
677	**1250**	2282	954	**1750**	3182
682	**1260**	2300	960	**1760**	3200
688	**1270**	2318	966	**1770**	3218
693	**1280**	2336	971	**1780**	3236
699	**1290**	2354	977	**1790**	3254
704	**1300**	2372	982	**1800**	3272
710	**1310**	2390	988	**1810**	3290
716	**1320**	2408	993	**1820**	3308
721	**1330**	2426	999	**1830**	3326
727	**1340**	2444	1004	**1840**	3344
732	**1350**	2462	1010	**1850**	3362
738	**1360**	2480	1016	**1860**	3380
743	**1370**	2498	1021	**1870**	3398
749	**1380**	2516	1027	**1880**	3416
754	**1390**	2534	1032	**1890**	3434
760	**1400**	2552	1038	**1900**	3452
766	**1410**	2570	1043	**1910**	3470
771	**1420**	2588	1049	**1920**	3488
777	**1430**	2606	1054	**1930**	3506
782	**1440**	2624	1060	**1940**	3524
788	**1450**	2642	1066	**1950**	3542
793	**1460**	2660	1071	**1960**	3560
799	**1470**	2678	1077	**1970**	3578
804	**1480**	2696	1082	**1980**	3596
810	**1490**	2714	1088	**1990**	3614
			1093	**2000**	3632

2000 to 3000

C.		F.	C.		F.
1093	**2000**	3632	1371	**2500**	4532
1099	**2010**	3650	1377	**2510**	4550
1104	**2020**	3668	1382	**2520**	4568
1110	**2030**	3686	1388	**2530**	4586
1116	**2040**	3704	1393	**2540**	4604
1121	**2050**	3722	1399	**2550**	4622
1127	**2060**	3740	1404	**2560**	4640
1132	**2070**	3758	1410	**2570**	4658
1138	**2080**	3776	1416	**2580**	4676
1143	**2090**	3794	1421	**2590**	4694
1149	**2100**	3812	1427	**2600**	4712
1154	**2110**	3830	1432	**2610**	4730
1160	**2120**	3848	1438	**2620**	4748
1166	**2130**	3866	1443	**2630**	4766
1171	**2140**	3884	1449	**2640**	4784
1177	**2150**	3902	1454	**2650**	4802
1182	**2160**	3920	1460	**2660**	4820
1188	**2170**	3938	1466	**2670**	4838
1193	**2180**	3956	1471	**2680**	4856
1199	**2190**	3974	1477	**2690**	4874
1204	**2200**	3992	1482	**2700**	4892
1210	**2210**	4010	1488	**2710**	4910
1216	**2220**	4028	1493	**2720**	4928
1221	**2230**	4046	1499	**2730**	4946
1227	**2240**	4064	1504	**2740**	4964
1232	**2250**	4082	1510	**2750**	4982
1238	**2260**	4100	1516	**2760**	5000
1243	**2270**	4118	1521	**2770**	5018
1249	**2280**	4136	1527	**2780**	5036
1254	**2290**	4154	1532	**2790**	5054
1260	**2300**	4172	1538	**2800**	5072
1266	**2310**	4190	1543	**2810**	5090
1271	**2320**	4208	1549	**2820**	5108
1277	**2330**	4226	1554	**2830**	5126
1282	**2340**	4244	1560	**2840**	5144
1288	**2350**	4262	1566	**2850**	5162
1293	**2360**	4280	1571	**2860**	5180
1299	**2370**	4298	1577	**2870**	5198
1304	**2380**	4316	1582	**2880**	5216
1310	**2390**	4334	1588	**2890**	5234
1316	**2400**	4352	1593	**2900**	5252
1321	**2410**	4370	1599	**2910**	5270
1327	**2420**	4388	1604	**2920**	5288
1332	**2430**	4406	1610	**2930**	5306
1338	**2440**	4424	1616	**2940**	5324
1343	**2450**	4442	1621	**2950**	5342
1349	**2460**	4460	1627	**2960**	5360
1354	**2470**	4478	1632	**2970**	5378
1360	**2480**	4496	1638	**2980**	5396
1366	**2490**	4514	1643	**2990**	5414
			1649	**3000**	5432

INTERPOLATION FACTORS

C.		F.	C.		F.
0.56	**1**	1.8	3.33	**6**	10.8
1.11	**2**	3.6	3.89	**7**	12.6
1.67	**3**	5.4	4.44	**8**	14.4
2.22	**4**	7.2	5.00	**9**	16.2
2.78	**5**	9.0	5.56	**10**	18.0

NOTE:—The numbers in bold face type refer to the temperature either in degrees Centigrade or Fahrenheit which it is desired to convert into the other scale. If converting from Fahrenheit degrees to Centigrade degrees the equivalent temperature will be found in the left column, while if converting from degrees Centigrade to degrees Fahrenheit, the answer will be found in the column on the right. These tables are a revision of those by Sauveur & Boylston, metallurgical engineers, Cambridge, Mass. Copyright, 1920.

Can Anybody Help?

BY SANDY COPELAND

In a recent serious accident occurring near our factory, one that involved the partial collapse of a building and injury to a number of people, there was found upon clearing away the débris, the piece of metal reproduced in the accompanying illustration.

Though the piece has an exasperatingly familiar look, no one about the place has been able to positively identify it. As it is absolutely certain that it is no part of anything that was legitimately around the place when the trouble started; as the immediate cause of the trouble was a mysterious explosion, of the force of which the piece bears ample evidence; and as there is more than suspicion that the event was not entirely accidental, we believe that its identification may lead to positive knowledge that will go far toward preventing a repetition of the event.

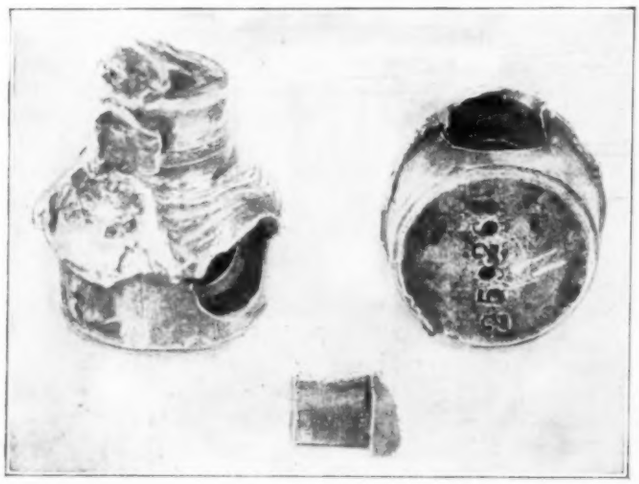
The object is of cold rolled steel, still bearing the toolmarks of the machine that produced it, and upon the larger end bears the maker's serial number running to six figures; indicating that it is by no means unique. The broken end is squared, indicating that a wrench was used in conjunction with it or that it was itself a wrench, belonging to some special machine or device.

The larger end is about 1 1/16 in. in diameter by 5/8 in. under the shoulder. The beveled part is also 5/8 in. long, running from the largest diameter down to the neck, which measures about 3/4 in. in diameter by 1/2 in. long. The square part, which has been broken off, was 3/4 in. square and of a length of course unknown.

The small piece to the right is apparently a shouldered stud, the smaller diameter fitting in the transverse hole shown in the large end of the piece. The diameter of this stud where it enters the hole is 3/4 in. and the shoulder apparently once fitted the counterbore. The stud was not broken off on the smaller end and therefore never passed more than half-way through the piece, though there might have been a similar stud in the other side, as the hole is counterbored at both ends.

Can anybody tell us what it is?

[We can vouch for our correspondent's sincerity in the above matter and are giving him publicity because of its importance. Any of our readers who can and will identify this piece of junk will have conferred a benefit upon humanity.—EDITOR.]

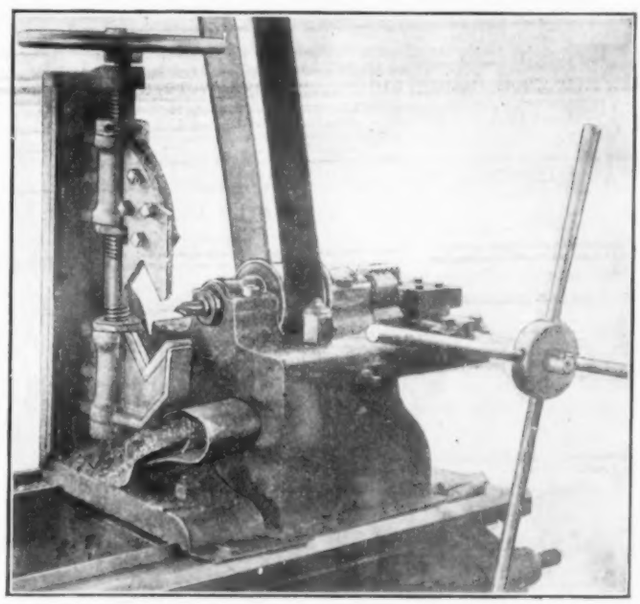


DO YOU KNOW WHAT THIS IS?

A Home-Made Centering Machine

BY JOHN VINCENT

Those who sometimes wonder what becomes of all the old machine tools should make a few visits to the out-of-the-way corners of shops where the tools past their prime are gradually slid away and relegated to other uses. In a shop recently visited, an old lathe bed now



A HOME-MADE CENTERING MACHINE

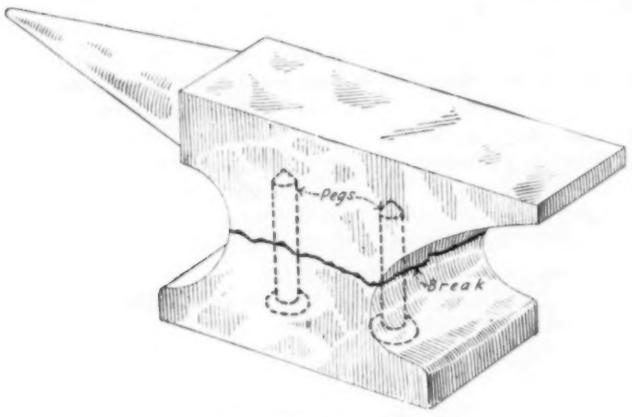
serves for the base of a centering machine as shown in the illustration. It has been fitted with a head casting carrying a sliding spindle driven by a single-speed pulley from the line shaft.

The spindle carries the centering tool and may be fed in and out by rack and pinion operated by the spoke wheel. It will be noted that a pipe vise for holding the work has been fitted on a vertical bracket that is bolted to the bed casting. The vise screws are fitted with an adjustment on each jaw so their position may be altered, should wear cause them to hold the work out of center.

Repairing a Broken Anvil

By G. Blake
Watford, England

"Repairing a Blacksmith's Vise," by Edward Heller, on page 795, vol. 51, of *American Machinist*, brings to the writer's mind the repairing of a blacksmith's anvil



THE BROKEN ANVIL

in the small shop where he served his apprenticeship. We had an anvil weighing about 250 lb., used principally for the forging of small lathe tools and similar work. It broke as shown in the sketch and was seemingly of no more use except as scrap iron; however, as this anvil was in constant demand in the shop and not being able to procure another one to replace it locally, it occurred to the writer that it could be repaired and made use of temporarily until the new one came along.

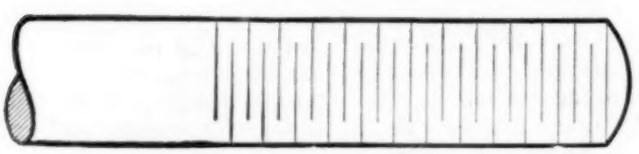
Two 1¼-in. holes were drilled and reamed in the base and through into the top part to a depth of 4½ in.; then two good fitting mild steel pegs were driven into position. This temporary repair lasted nine months.

Right-Angle Conventional Thread

By R. Beaver

On page 564-e of the *American Machinist*, there is shown a special triangle for indicating threads.

I attach a sketch showing a method of thread indicating. It is very simple and is always done at right angles with the axis. Everybody is familiar with this method but it is not much used, judging from what I see.



CONVENTIONAL THREAD

A Slide-Rule Kink

By Henry R. Bowman

I have struck on a little slide rule kink that simplifies the finding of a diameter when the number of sides of an inscribed polygon and the length of a side are known.

This applies to finding the pitch diameter of a sprocket or gear when the pitch (chordal) and number of teeth are known. Place the slide in the reversed position (trig. scales up) with indices exactly in line; scribe an accurate line on the sine scale opposite the graduation marked "2" on the left-hand "A" scale and fill in with ink or black shellac varnish so that it will be legible. Work out the formula: $A = \frac{180^\circ}{n}$ in the usual way on the "C" and "D" scales giving the center angle of the triangle of which the short side is one-half of the pitch and the hypotenuse the required radius.

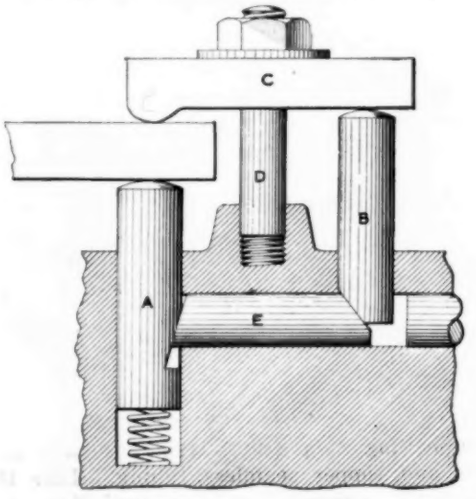
Set the runner to one-half of the pitch on the "A" scale, bring the angle *A* under the hair line of the runner, and over the scribed line on the sine scale read the required diameter on the "A" scale. This saves three operations; viz, moving the runner to the indices, reversing and resetting the slide and moving the runner to the graduation marked 2 on the "B" scale.

Clamping Device with Automatically Locked Spring Plunger Support

By George G. Little

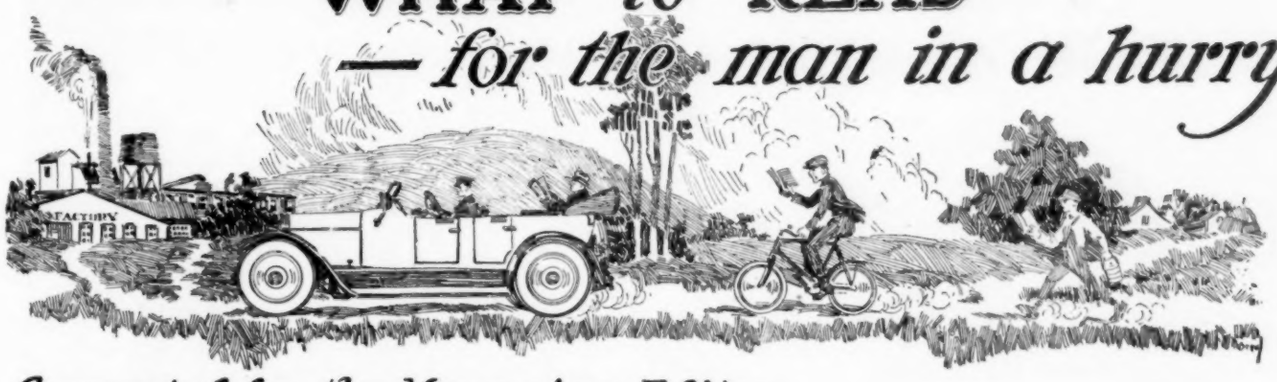
Referring to the article on page 722, vol. 52, of *American Machinist*, entitled "Clamping Device With Automatically Locked Spring Plunger": It is not an efficient clamp owing to the difference in power of the two wedge surfaces *A* and *B* shown in the illustration herewith. This difference will permit the clamp *C* to force the work and spring plunger to a point below the spring locating position for the reason that the action of the wedge *A*, under same amount of pressure as applied to *B*, causes the spring plunger to crowd the pin *E* in the direction indicated by the arrow and which in turn crowds the pin *B* upward.

To overcome this fault the stud *D* should be located near enough to *B* to reduce the pressure on *A* sufficiently to equalize the pressures upon *A* and *B*.



THE EQUALIZING CLAMP THAT DOES NOT EQUALIZE

WHAT *to* READ
—for the man in a hurry



Suggested by the Managing Editor

ANOTHER new tool description for a leader in this week's issue. The subject of the description is the double carriage production lathe of the Hamilton Machine Co.

On page 1023 is a rather unusual article on "Deep Hole Drilling," the first one of any importance we have had since Mr. DeLeeuw's series on the manufacture of the 75-mm. gun carriage. The author, Charles J. Starr of the New Britain Machine Co., tells of his experiences with some standard commercial drills for this work, points out the difficulties encountered and describes in detail the design of the drills that were finally found satisfactory for the work in question.

What to read was not a difficult matter to decide two hundred years ago when books were few and magazines unheard of. It is far different now when so much reading matter is offered to pass the time pleasantly or profitably as the reader chooses. We are doing our utmost to make the "American Machinist" not only profitable but indispensable as a clearing house of ideas and news of the machinery world. This page is the editors' advertisement of their section of the paper. It gives the high spots

All sorts of elaborate accounting systems have been worked out for the big shops and factories, but most of them have been entirely too complicated for the fellow with the little shop. On page 1026 there are some sample forms and a description of their use in a shop where the bookkeeping, costkeeping and correspondence are all taken care of by one girl.

The last of Prof. Bonis' articles on the simplification of acceleration determinations begins on page 1027. This one is supplementary to the one published last week in that it gives proofs of some of the steps taken in the various constructions which were assumed to be correct in the other article. The applications here are to the quadric chain and to the bar and circular link mechanism.

Then we have a manufacturing article describing the building of saw-mill machinery in the shops of the Willamette Iron Works out in Oregon. This is another of the stories Fred H. Colvin picked up on his trip to the coast last summer.

The fourth installment of "Seven Centuries of Brass Making" starts on page 1033. This week Mr. Kenyon discusses the making of phono-electric wire and also that of brass and copper seamless tubing. Like the other articles in this series this one is so well illustrated that it is hardly necessary to give very much descriptive matter to make the operations clear.

Designers and gear men will be interested in a suggested formula and tables for determining the proper backlash for spur gears. The author of the suggestions is C. H. Logue of the Brown-Lipe Chapin Co. and his work appears on pages 1040 and 1041.

The last of the series of sketches and brief descriptions of "Modern Airplane Engines" starts on page 1042. In this one we have four American commercial engines and in the description something on the future of aviation. This was written some months ago but little has happened since then to make any changes in the situation.

Our old friend Entropy is with us again on page 1044 with some remarks on the field for employment management. Most of us will agree with him when he says, "Polite stealing of help, big advertisements and all that goes with it have sunk out of sight. From now on it looks as though the function of an employment management is the legitimate one of a more or less scientific selection of help and their careful and thorough training for the jobs they are to do, and then making them content with the jobs but not content to make little of them."

Storing machine screws in a salt shaker sounds a little wild but it is only one of several interesting stunts described in Hunter's article on Building Optical Instruments. See page 1045. Following Hunter's article is one by E. A. Dixie on the marking of hardened tools by the etching process. Dixie knows how to handle the etcher's tools and you can believe what he says.

An unusually useful temperature conversion table is printed on page 1052. With it before you, you can take any number and secure immediately its equivalent either in Centrigrade or Fahrenheit degrees.

Beginning on page 1057 we have the story of the first meeting of American Engineering Council of the Federated Engineering Societies. Mr. Morrow attended this meeting for the *American Machinist* and gives in detail a running account of the events as they occurred and his impression of the sense of the meeting. We also have President-elect Hoover's speech in full. You can't afford to miss this. It is one of the best things that has come to our attention in a long time.

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SOCIETY of INDUSTRIAL ENGINEERS
TREASURER

First Meeting of American Engineering Council of the Federated American Engineering Societies

TWENTY-ONE member-societies and ten participating organizations were represented at the opening session of American Engineering Council, the managing body of the Federated American Engineering Societies. All meetings of the three-day convention, Nov. 18, 19 and 20, were held in the New Willard Hotel, Washington, D. C. The thirty-one societies, having a total membership of about 60,000, sent seventy-two delegates. These societies represent 50 per cent of the aggregate membership invited, the member-societies alone representing 35 per cent.

Richard L. Humphrey, chairman of the Joint Conference Committee, called the Thursday meeting to order and made a short address in which he gave a brief accounting of the stewardship which was entrusted to the Joint Conference Committee at the organizing conference in June. He then outlined the activities which appeared to lie before the organization. Among them he included the organization and cataloging of the engineering resources of this country; constructive suggestions based upon careful study of the great national problems, such as transportation, conservation of labor, water, fuel and other natural resources; the securing of a National Department of Public Works; and assisting in many problems connected with the National Budget System. Mr. Humphrey closed his address by referring to the purposes of solidarity and service which have prompted the organization of the Federation: "The first step in realizing the dream of the engineering and allied technical professions for solidarity has been taken. The development of this solidarity is in the hands of the representatives of the member-societies of the Federated American Engineering Societies.

"The profession is looking with intense interest to this meeting and is hopefully anticipating forward work.

"The confidence which the speaker felt and voiced in his opening remarks at the organizing conference concerning the success of that meeting he now feels in far greater measure for the success of the Federated American Engineering Societies in accomplishing the desired end of solidarity in the engineering and allied technical organizations because of the great and growing enthusiasm for this organization; with no desire to repeat his previous address at the opening of the organizing conference on June 3, the speaker wishes to emphasize that in his judgment the keynote of that meeting was the 'desire first to serve our country, and, second, to serve the societies and organizations of which we are the representatives.' And it would seem to the speaker from all circumstances which have led up to the creation of this organization that the keynote of whatever policy you may agree upon now should be 'Service.'

"Indeed, the organization by the preamble adopted at the Organizing Conference, at which it was created, is dedicated to the service of the City, State, and Nation. In living up to this, you should carefully guard each act and each step in the progress of the organization, to the end that the Federated American Engineering Societies shall stand for the highest possible ideals and shall enrich the glorious traditions of the engineering and allied technical profession."

E. S. Carman, Cleveland, of the American Society of Mechanical Engineers, was elected temporary chairman and William E. Rolfe, St. Louis, Mo., of the Associated Engineering Societies of St. Louis, was elected temporary secretary. Immediately after the temporary officers had taken their chairs, a resolution was passed expressing regret that Mr. Humphrey and his colleagues of the American Society of Civil Engineers were not sitting with the Council officially. They were given the privilege of the floor throughout the meeting of the Council and the same privilege was granted the representatives of participating organizations.

The following temporary committees were appointed, the various duties being distributed to national, regional, state and local delegates: Program; credentials; constitution and by-laws; nominations; plan and scope; budget; resolutions.

As provided by the constitution the local member-societies were divided into groups, or districts, geographically, so that they will be able to get together without an undue amount of travel. Six districts were named, each of which is entitled to one representative on the executive board. The national societies are entitled to fourteen representatives on the executive board, making with the representatives from the local societies, a total of twenty. The other four members of the executive board (the constitution provides for twenty-four) were not to be named from the present member-societies, but from societies which it is expected will join. A resolution was then passed to the effect that any society joining by July 1, 1921, shall be a charter member.

The remainder of the morning session was devoted to a discussion of the location for headquarters. The choice quickly narrowed to New York or Washington but no decision was reached and the matter was deferred for later discussion.

Thursday Afternoon Session

Thursday afternoon was devoted to reports of the program and credentials committees, to addresses on Engineering Council and to discussion concerning the location of headquarters for American Engineering Council. Washington was finally chosen, an amendment to refer the matter to the executive board with power to act having been defeated. It was explained that at any time the board by consent of the council can change the place of the headquarters.

J. Parke Channing, chairman, Engineering Council, spoke on "Engineering Council." He told of the struggles which the council had during its earliest days and how things eventually straightened out until for the last two years Engineering Council has been sailing in smooth water. He then read the following list of accomplishments of the council and suggested that American Engineering Council follow in a general way the lines of Engineering Council based on its four years' experience.

"During the war we furnished the Government with the names of 4,000 engineers for war service; aided the Naval Consulting Board and the Army General Staff in examining 135,000 suggestions and inventions for war devices; assisted the Fuel Administrator and the Bureau of Mines in fuel conservation; helped secure exemption of engineer students from military service until the completion of their technical training; and supplied Congress with information about water power.

"On Jan. 1, 1919, we opened an office in Washington giving varied service to engineers, especially in supplying information concerning Congressional and Departmental activities and have also aided the Government in engineering matters.

"In April, 1919, we called a Conference at Chicago of seventy-four technical organizations having 105,000 members. This conference is permanently organized and is advocating the establishment of a National Department of Public Works by the modification of existing departments.

"Through an appeal to the President, we have brought together a conference of fourteen Government offices engaged in map making, with prospects of getting under one head the completion of the topographical map of the United States.

"We aided in securing increases of pay for railway technical engineers.

"We now have a Classification and Compensation Committee of Engineers, with sections on Railways, Federal Government, Municipal and State Governments, and are accomplishing results.

"We are working in harmony with the Congressional Joint Committee on Reclassification of Salaries.

"We have aided in the reinstatement of 350 engineers unfairly dismissed by the city of New York.

"We have organized a committee on types of Government contracts.

"We have just drafted a typical law for the registration of engineers.

"We have assisted the State of New York in preparing for the reorganization of State Government, particularly with reference to engineering branches.

"We joined with the National Research Board in a report on an improvement of the patent system as a result of which legislative action is being taken.

"We have participated in organizing the National Board of Jurisdictional Awards in the building industry and have a member thereon.

"Only last week, and at the request of the Federal Power Commission, we made recommendations to it concerning vital questions in the administration of this commission, and about a month ago we did the same thing for the State of Maine.

"This is only a partial list of what we have accomplished but it shows the general lines along which we have been working."

Alfred D. Flinn, secretary of Engineering Council and Dr. D. S. Jacobus and Philip N. Moore, members, described phases of the work of Engineering Council.

A brief discussion of highways, railways and canals was led by Lewis B. Stillwell, New York, N. Y., of the American Institute of Electrical Engineers.

Just before adjournment it was announced that the application for membership of the Taylor Society had been received and that Morris L. Cooke, Philadelphia, was its delegate.

L. W. Wallace, Baltimore, Md., of the Society of Industrial Engineers, opened the Friday morning session with an address on "Conservation of Labor." He spoke of human beings as the most important element in economics and the source of all wealth; analyzed the work done by the safety advisor and the welfare director; remarked concerning medical service, education and labor troubles. In conclusion he said that it is the duty of the engineer to analyze some conditions and foresee others and of the industrial engineer to prescribe for the ills of industry.

Hoover Elected President

Following the report of the committee on nominations Herbert Hoover, of the American Institute of Mining and Metallurgical Engineers, was elected president by unanimous ballot. Calvert Townley, New York, American Institute of Electrical Engineers, and William E. Rolfe, St. Louis, Associated Engineering Societies of St. Louis, were elected vice-presidents for two years. Dexter S. Kimball, Ithaca, N. Y., American Society of Mechanical Engineers and J. Parke Channing, New York, N. Y., American Institute of Mining and Metallurgical Engineers, were elected vice-presidents for one year. L. W. Wallace, Baltimore, Md., the Society of Industrial Engineers, was elected treasurer. In accepting the office of president of American Engineering Council Mr. Hoover said that he could not refuse to take any service where he could be of value to his profession and to the world at large; that he has long been in favor of such an association to enable the engineer to have a voice in the community; and that there has been no time when we have so needed the benefits of the knowledge of the trained engineer, who alone is able to speak on broad engineering subjects.

A number of amendments to the constitution and by-laws were voted on and the constitution and by-laws as amended were adopted. Among the amendments adopted were those changing the term "executive officer" to "executive secretary;" specifying "at least bimonthly" instead of "regular monthly" meetings, except during July and August; making the contributions of each member-society payable "quarterly" (on Jan. 1, April 1, July 1 and Oct. 1) instead of "semi-annually;" and changing the time limit for payment of dues to three months instead of six.

Friday Afternoon Session

The first business completed during the Friday afternoon session was that of announcing the twenty members of the Executive Board from the six districts to which the member-societies had been allocated geographically and from the national societies. Following are the names of the members and the sections or societies which they represent:

District No. 1.—New England and the State of New York.—W. B. Powell, Buffalo, N. Y., Engineering Society of Buffalo, and Byron E. White, Utica, N. Y., Mohawk Valley Engineers' Club—one-half vote each.

District No. 2.—Michigan, Wisconsin and Minnesota. —Burritt A. Parks, Grand Rapids, Mich., Grand Rapids Engineering Society, and D. J. Sterrett, Detroit, Mich., Detroit Engineering Society—one-half vote each.

District No. 3.—Ohio, Indiana and Illinois.—John F. Oberlin, Cleveland, Ohio, the Cleveland Engineering Society.

District No. 4.—Pennsylvania, Delaware, Maryland and the District of Columbia.—W. W. Varney, Baltimore, Md., The Engineers' Club of Baltimore.

District No. 5—All the southern states, including Louisiana and Texas.—O. H. Koch, Dallas, Texas, Technical Club of Dallas.

District No. 6.—Other local societies west of the Mississippi.—Lloyd B. Smith, Topeka, Kan., Kansas Engineering Society.

American Institute of Chemical Engineers.—Harrison E. Howe, Washington, D. C.

American Institute of Electrical Engineers.—H. W. Buck, New York, N. Y.; William McClellan, Philadelphia, Pa.; Charles F. Scott, New Haven, Conn.; Lewis B. Stillwell, New York, N. Y.

American Institute of Mining and Metallurgical Engineers.—Arthur S. Dwight, New York, N. Y.; Edwin Ludlow, New York, N. Y.; Philip N. Moore, St. Louis, Mo.

American Society of Agricultural Engineers.—Samuel H. McCrory, Washington, D. C.

American Society of Mechanical Engineers.—L. P. Alford, New York; Arthur M. Greene, Jr., Troy, N. Y.; E. S. Carman, Cleveland, Ohio; Fred J. Miller, Center Bridge, Pa.

The Taylor Society.—Morris L. Cooke, Philadelphia, Pa.

The report of the committee on plan and scope proposed that subjects for consideration by American Engineering Council may be initiated either by the board itself or by outside sources; the endorsement of Engineering Council's work; and the assumption of its topics. A list of topics was submitted, as follows:

1. To serve the public interest by investigation and advice to all public governmental and voluntary bodies, dealing with national economic problems.
2. Department of Public Works.
3. Conservation of natural resources.
4. Co-operation with other national organizations, technical, industrial and commercial.
5. Technical education.
6. Transportation, particularly highways.
7. Advice to state, regional and local societies.
8. National Bureau of Economic Research.
9. Public fire protection.
10. Patents.
11. National Board for Jurisdictional Awards.
12. International affiliation of engineers.
13. State organization of local affiliations.
14. Licensing and local registration of professional engineers.
15. Classification and compensation of engineers.
16. Engineering societies service bureau.

The report of the budget committee showed an estimated minimum income of $59,000 for the coming year, based on the assumption that no more societies will join the Federation and an estimated maximum income of $80,000 based on the assumption that all of the societies designated on the program as "participating" will join. The estimated minimum and maximum expenses of the organization for the year amounted to $56,500 and $92,500.

The American Engineering Council finished the business of its first meeting by passing resolutions of thanks to the four founder societies and to the Engineering Society of Washington; of appreciation and thanks to Richard L. Humphrey; and of appreciation concerning the support given by the daily and technical press.

At the evening session Herbert Hoover delivered an address, "Some Phases of Relationship of Engineering Societies to Public Service." Following this address there was an informal reception and smoker tendered by the engineering societies of Washington, D. C.

Meeting of the Executive Board

The first meeting of the executive board, held on Saturday morning, was presided over by vice-president William E. Rolfe. Charles F. Scott was elected temporary secretary. Representatives of participating societies were given the privilege of the floor.

Calvert Townley, L. P. Alford, John F. Oberlin, Charles F. Scott, Philip N. Moore and L. W. Wallace were named to act as a committee with President Hoover to canvas the persons eligible for the position of executive-secretary and to report as soon as practicable to the board.

Other results of the session of the executive board were the approval of the councils' action in selecting Washington as the headquarters; approval of the extension of time for charter-membership to July 1, 1921; and reference of the resolution on publicity to the committee on publicity and publications when appointed. It was voted to constitute the committee of Engineering Council on the Nolan patent bill the committee of American Engineering Council.

It was voted that the next meeting be called at the discretion of the president, not later than the month of January.

A resolution was passed favoring compilation and publication in English of Critical Tables of Physical and Chemical Constants.

The executive board endorsed the plan of Mr. Hoover for an investigation of industrial waste and authorized him to form an organization for this purpose.

The question of how dues are to be leveled by classes of membership of constituent societies was referred to the committee on membership and representation for report.

The executive board passed a resolution recognizing the great importance of the movement to organize and establish a Department of Public Works and declaring itself in favor of adding its efforts to that end.

Calvert Townley and William E. Rolfe were elected vice-chairmen of the executive board, and L. P. Alford was named to serve as temporary secretary until the next meeting. It was voted to request the American Society of Mechanical Engineers to assist Mr. Alford.

A Letter from A. S. C. E.

The following letter from the American Society of Civil Engineers was read with no little interest and with some surprise:

November 15, 1920.

Mr. Alfred D. Flinn, Secretary,
Engineering Council,
Washington, D. C.

I beg to transmit the following action of the Board of Direction of this Society taken at its meeting of November 9, 1920.

Whereas, the American Society of Civil Engineers by a vote of 3,278 to 2,330 has decided not to become a charter member of the Federated American Engineering Societies, and

Whereas, it has been suggested that the work of Engineering Council should be turned over to and taken up by the said Federated American Engineering Societies; be it

Resolved, that the Board of Direction hereby instructs its representatives upon Engineering Council to state to Engineering Council that they cannot participate in any action by Engineering Council in transfering its activities to the Federated American Engineering Societies.

Be it further resolved, that the Board instructs its representatives to express to the Council its hope that Engineering Council will for the present continue to carry forward its work.

Yours very truly,
(Signed) H. S. CROCKER,
Acting Secretary.

It appears that this unexpected move on the part of the A. S. C. E. may have some effect on what would otherwise be the smooth transfer of the affairs of Engineering Council to American Engineering Council. One of the rules of Engineering Council is that a negative action on the part of one of the member-societies holds up the action of the council. Therefore by action as indicated in its letter the A. S. C. E. can hold up the transfer. Such action might result in its being necessary for Engineering Council to go out of existence for lack of funds as three of the member-societies will withdraw from the council on Dec. 31. Or the three societies remaining with representatives on Engineering Council might carry on the council and its work. There is another point for consideration which is that Engineering Council functions under the United Engineering Societies which may have jurisdiction and be able to bring about the transfer of work from Engineering Council to American Engineering Council, dissolving the earlier organization.

MEMBER-SOCIETIES AND REPRESENTATIVES

Alabama Technical Association, Birmingham, Ala., Paul Wright, Birmingham, Ala.

American Institute of Chemical Engineers, Brooklyn, N. Y., Allerton S. Cushman, Washington, D. C.; Harrison E. Howe (alternate), Washington, D. C.

American Institute of Electrical Engineers, New York, N. Y., Calvert Townley (chairman), New York, N. Y.; Comfort A. Adams, Cambridge, Mass.; A. W. Berresford, Milwaukee, Wis.; H. W. Buck, New York, N. Y.; F. L. Hutchinson, New York, N. Y.; G. A. Waters, St. Louis, Mo.; William McClellan, Philadelphia, Pa.; L. F. Morehouse, New York, N. Y.; J. H. Finney, Washington, D. C.; Charles S. Ruffner, New York, N. Y.; Charles F. Scott, New Haven, Conn.; Lewis B. Stillwell, New York, N. Y.

American Institute of Mining and Metallurgical Engineers, New York, N. Y., Herbert Hoover, Palo Alto, Cal.; J. Parke Channing, New York, N. Y.; Arthur S. Dwight, New York, N. Y.; Edwin Ludlow, New York, N. Y.; Allen H. Rogers, Boston, Mass.; Philip N. Moore, St. Louis, Mo.; Percy E. Barbour, New York, N. Y.; Joseph W. Richards, Bethlehem, Pa.

American Society of Agricultural Engineers, Ames, Iowa, Samuel H. McCrory, Washington, D. C.

American Society of Mechanical Engineers, New York, N. Y., L. P. Alford (chairman), New York, N. Y.; Charles T. Main, Boston, Mass.; Arthur M. Greene, Jr., Troy, N. Y.; E. S. Carman, Cleveland, Ohio; Arthur L. Rice, Chicago, Ill.; Dexter S. Kimball, Ithaca, N. Y.; Paul Wright, Birmingham, Ala.; W. A. Hanley, Indianapolis, Ind.; William B. Gregory, New Orleans, La.; V. M. Palmer, Rochester, N. Y.; H. P. Porter, Tulsa, Okla.; Robert H. Fernald, Philadelphia, Pa.; L. C. Nordmeyer, St. Louis, Mo.; Fred J. Miller (alternate), Centre Bridge, Pa.; Robert Sibley (alternate), San Francisco, Cal.; Charles Whiting Baker (alternate), New York, N. Y.

Associated Engineering Societies of St. Louis, Mo., William E. Rolfe, St. Louis, Mo.

Detroit Engineering Society, Detroit, Mich., D. J. Sterrett, Detroit, Mich.

Engineering Association of Nashville, Tenn., A. F. Ganier, Nashville, Tenn.

Engineering Society of Buffalo, N. Y., W. B. Powell, Buffalo, N. Y.

Grand Rapids Engineering Society, Grand Rapids, Mich., Burritt A. Parks, Grand Rapids, Mich.

Kansas Engineering Society, Topeka, Kan., Lloyd B. Smith, Topeka, Kan.

Louisiana Engineering Society, New Orleans, La., William B. Gregory, New Orleans, La.

Mohawk Valley Engineers' Club, Utica, N. Y., Byron E. White, Utica, N. Y.

Technical Club of Dallas, Tex., O. H. Koch, Dallas, Tex

The Cleveland Engineering Society, Cleveland, Ohio, John F. Oberlin, Cleveland, Ohio.

The Engineers' Club of Baltimore, Md., W. W. Varney, Baltimore, Md.

The Society of Industrial Engineers, Chicago, Ill., L. W. Wallace, Baltimore, Md.

Washington Society of Engineers, Washington, D. C., E. C. Barnard, Washington, D. C.

York Engineering Society, York, Pa., William J. Fisher, York, Pa.; H. A. Delano (alternate), York, Pa.

PARTICIPATING ORGANIZATIONS AND DELEGATES*

American Institute of Architects, Washington, D. C., Percy C. Adams, Washington, D. C.

American Society of Heating and Ventilating Engineers, New York, N. Y., Champlain L. Riley, New York, N. Y.

American Society for Testing Materials, Philadelphia, Pa., C. D. Young, Reading, Pa.; C. L. Warwick, Philadelphia, Pa.

Florida Engineering Society, Gainesville, Fla., L. R. McLain, St. Augustine, Fla.

Illuminating Engineering Society, New York, N. Y., Walter C. Allen, Washington, D. C.

Iowa Engineering Society, Iowa City, Iowa, John H. Dunlap, Iowa City, Iowa.

National Fire Protection Association, Boston, Mass., Ira H. Woolson, New York, N. Y.; D. Knickerbacker Boyd, Philadelphia, Pa.

Society of Automotive Engineers, New York, N. Y., Howard E. Coffin (chairman), Detroit, Mich.; David Beecroft, New York, N. Y.; Coker F. Clarkson, New York, N. Y.; H. M. Crane, New York, N. Y.; C. F. Kettering, Dayton, Ohio; H. M. Swetland, New York, N. Y.

Society for the Promotion of Engineering Education, Pittsburgh, Pa., F. L. Bishop, Pittsburgh, Pa.

Taylor Society, New York, N. Y., Morris L. Cooke, Philadelphia, Pa.

Engineering Society of Massachusetts, C. L. Newcombe, Holyoke, Mass.

*These organizations are either considering or have given the matter of membership favorable considerattion but have not taken final action.

Some Phases of Relationship of Engineering Societies to Public Service

THE Federation of Engineering Societies, embracing the membership of between 100,000 and 200,000 professional engineers, has been created for the sole purpose of public service. This initial meeting surely warrants some discussion of a few of the problems to which this organization, for expression of the engineering mind, can quite well give consideration.

One of the greatest of the problems before the country and in fact, before the world, are those growing out of our industrial development. The enormous industrial expansion of the last fifty years has lifted the standard of living and comfort beyond any dream of our forefathers. Our economic system under which it has been accomplished has given stimulation to invention, to enterprise, to individual improvement of the highest order; yet it presents a series of human and social difficulties to the solution of which we are groping. The congestion of population is producing subnormal conditions of life. The vast repetitive operations are dulling the human mind. The intermittency of employment due to the bad co-ordination of industry, the great waves of unemployment in the ebb and flow of economic tides, produce infinite wastes and great suffering. Our business enterprises have become so large and complex that the old personal relationship between employer and worker has to a great extent disappeared. The aggregation of great wealth, with its power of economic domination, presents social, economic ills which we are constantly struggling to remedy.

I propose to traverse only a small fraction of these matters. I do not conceive that any man, or body of men, is capable of drafting in advance a plan that will solve these multiple difficulties and preserve the system which makes individual initiative possible. We have presented to us economic social patent medicines of one kind or another and in fact the great panacea of socialism is today in actual trial in its various forms. In Russia the attempt has been made to apply the most extreme form of complete communism. The Russian experiment is bankrupt in production. The populations of our modern states have been built up to numbers dependent upon an intensity of production that can only be maintained by stimulation of individual effort through the impulse of self-interest, and a departure from this primary incentive to production has now been demonstrated to lead only to famine and flame and anarchy. We have even had a gigantic experiment imposed upon the United States by the war in the necessity to operate a vast merchant marine at the hands of the Government, with a result that should offer little consolation to those who advocate even the mildest application of socialism.

We have built up our civilization, political, social and economic, on the foundation of individualism. We have found in the course of development of large industry upon this system that individual initiative can be destroyed by allowing the concentration of industry and service, and thus an economic domination of groups over the whole. We have therefore built up public agencies intended to preserve an equality of opportunity through control of possible economic domination. Our mass of regulation of public utilities and of many other types of industry, aiming chiefly to prevent combinations in restraint of free enterprise, is a monument to our attempts to limit this economic domination—to give a square deal. This regulation is itself also proof of the abandonment of the unrestricted capitalism of Adam Smith. While our present system of individualism under controlled capitalism may not be perfect, the alternative offers nothing that warrants its abandonment. Our thought, therefore, needs to be directed to the improvement of this structure and not to its destruction.

A profound development of our economic system apart from control of capital and service during the last score of years has been the great growth and consolidation of voluntary local and national associations. These associations represent great economic groups of common purpose and are quite apart from the great voluntary groups created solely for public service. We have the growth of great employers' associations, great farmers' associations, great merchants' associations, great bankers' associations, great labor associations—all economic groups striving by political agitation, propaganda and other measures to advance group interest. At times they come in sharp conflict with each other and often enough charge each other with crimes against public interest. And to me one question of the successful development of our economic system rests upon whether we can turn the aspects of these great national associations toward co-ordination with each other in the solution of national economic problems, or whether they grow into groups for more violent conflict. The latter can spell breakdown to our entire national life.

This engineers' association stands somewhat apart among these economic groups in that it has no special economic interest for its members. Its only interest in the creation of a great national association is public service, to give voice to the thought of the engineers in these questions. And if the engineers, with their training in quantitative thought, with their intimate experience in industrial life, can be of service in bringing about co-operation between these great economic groups of special interests, they will have performed an extraordinary service. The engineers should be able to take an objective and detached point of view. They do not belong to the associations of either employers or labor, of farmers, or merchants or bankers. Their calling in life is to offer expert service in constructive solution of problems, to the individuals in any of these groups. There is a wider vision of this expert service in giving the group service of engineers to group problems.

We have just passed through a period of unparalleled speculation, extravagance and waste. We shall now not only reap its inevitable harvest of unemployment and readjustment, but we shall feel the real effect of four years of world destruction, and from it economic and social problems will stand out in vivid disputation. One of the greatest conflicts rumbling up in the distance is that between the employer on one side and organized labor on the other. We hear a great deal from extremists on one side about the domination of the employer and on the other about the domination of organized

*Address of Herbert Hoover before American Engineering Council of the Federated American Engineering Societies.

labor. Probably the tendency to domination exists among the extremists on both sides. One of the most perplexing difficulties in all discussion and action in these problems is to eliminate this same extremist. There are certain areas of conflict of interest, but there is between these groups a far greater area of common interest, and if we can find measures by which, through co-operation, the field of common interest could be organized, then the area of conflict could be in the largest degree eliminated.

In this connection the employer sometimes overlooks a fundamental fact in connection with organized labor in the United States. This is that the vast majority of its membership and of its direction are individualists in their attitude of mind and in their social outlook; that the expansion of socialist doctrines finds its most fertile area in the ignorance of many workers and yet the labor organizations, as they stand today, are the greatest bulwark against socialism. On the other hand, some labor leaders overlook the fact that if we are to maintain our high standards of living, our productivity, it can only be in a society in which we maintain the utmost possible initiative on the part of the employer; and further, that in the long run we can only expand the standard of living by the steady increase of production and the creation of more goods for division over the same numbers.

The American Federation of Labor has publicly stated that it desires the support of the engineering skill of the United States in the development of methods for increasing production and I believe it is the duty of our body to undertake a constructive consideration of these problems and to give assistance not only to the federation of labor but also to the other great economic organizations interested in this problem, such as the employers' association and the chambers of commerce.

It is primary to mention the three causes of waste in production: first from intermittent employment, second from unemployment that arises in shifting of industrial currents, and third from strikes and lockouts. Beyond this elimination of waste there is another field of progress in the adoption of measures for positive increase in production.

In the elimination of the great waste and misery of intermittent employment and unemployment, we need at once co-ordination in economic groups. For example, our engineers have pointed out time and again to the bituminous coal industry where the bad economic functioning of that industry results in an average of but 180 days' employment per annum, where a great measure of solution could be had if a basis of co-operation could be found between the coal operators, the coal miners, the railways and the great consumers. The combined result would be a higher standard of living to the employees, a reduced risk to the operator, a fundamental expansion of economic life by cheaper fuel. With our necessary legislation against combination and the lack of any organizing force to bring about this co-operation, the industry is helpless unless we can develop some method of Governmental interest, not in Governmental ownership, but in stimulation of co-operation in better organization.

In help against the misery in the great field of seasonal and other unemployment, we indeed need an expansion and better organization of our local and Federal labor exchanges. We have a vast amount of industry, seasonal in character, which must shift its labor complement to other industries. The individual worker is helpless to find the contacts necessary to make this shift unless the machinery for this purpose is provided for him.

In the questions of industrial conflict resulting in lockouts and strikes, one mitigating measure has been agreed upon in principle by all sections of the community. This is collective bargaining, by which, whenever possible, the parties should settle their difficulties before they start a fight.

It is founded not only on the sense of prevention but on the human right to consolidate the worker in a proper balanced position to uphold his rights against the consolidation of capital. This measure, advocated for years by organized labor, was agreed to by the employers' group in the First Industrial Conference. It has been supported on the platform of both political parties. The point where the universal application of collective bargaining has broken down is in the method of its execution. The conflict arises almost wholly over the question of representation and questions of enforcement. The employer in some industries denies the right of men other than his own employees to conduct the negotiations. Labor organizations demand that, as such negotiations require skill, experience and bargaining freedom, they are of more than local application and that thus they can only protect the body of workers by presenting the case on their behalf by skilled negotiators.

The Second Industrital Conference, of which I was a member, proposed a solution to this point by the provision that where there was a conflict over representation the determination should be left to a third and independent party. It also proposed that each party should have the right to summon skill and experience to its assistance. It further proposed that where one of the parties at dispute refuses to enter upon collective bargaining, the entire question should be referred to an independent tribunal for investigation as to the right and wrong of the whole dispute—but only for investigation and report. That conference, embracing both a great employer and a most distinguished representative of organized labor, was completely convinced that the illumination of the public mind as to the rights and wrongs of these contentions would in itself make for material progress in their solution, and that in public education and the condemnation of public opinion of wrong-doing lay the root to real progress. No group should be afraid of authoritative publicity in these matters and I believe it would greatly advance an understanding of the cause of labor. The conference did not believe that industrial contention could be cured by compulsory arbitration or any other form of Governmental repression which must in the end use the jails for enforcement. The principles formulated by that conference should have your consideration.

There are questions in connection with this entire problem of employer and employee relationship, both in its aspects of increased production and in its aspects of wasteful unemployment, that deserve most careful study by our engineers. There lies at the heart of all these questions the great human conception that this is a community working for the benefit of its human members, not for the benefit of its machines or to aggrandize individuals; that if we would build up character and abilities and standard of living in our people, we must have regard to their leisure for citizenship, for recreation and for family life. These considerations, together with protection against strain, must be the fundamen-

tals of determination of hours of labor. These factors being first protected, the maximum production of the country should become the dominating purpose. The precise hours of labor should and will vary with the varying conditions of trades and establishments, but the proper determination of hours, based upon these factors, is an immediate field demanding attention of engineers. There is no greater economic fallacy than the doctrine that the decrease of hours below these primary considerations makes for employment of greater numbers.

There is a broad question bearing upon stimulation of self-interest, and thus increase in production that revolves around the method of wage payment. I need not review to you the advantages, difficulties and weaknesses of bonus, piece work or profit sharing plans that are in use as a remedy for the deadening results of the same wage payment to good and bad skill alike. The suggestion I wish to put for your consideration is the possible use of another device in encouragement of individual interest and effort by creating two or three levels of wage in agreements for each trade, the position of each man in such scale to be based upon comparative skill and character. This plan should be developed upon the principle of graded extra compensation, for added skill and performance, above an agreed basic wage. In order to give confidence, the classification under such scales must be passed upon by representatives of the workers in such shop or department. This plan is now being successfully experimented with.

We must take account of the tendencies of our present repetitive industries to eliminate the creative instinct in its workers, to narrow their field of craftsmanship, to discard entirely the contribution to industry that could be had from their minds as well as from their hands. Indeed, if we are to secure the development of our people, we cannot permit the dulling of these sensibilities. Indeed, we cannot accomplish increased production without their stimulation. Here again we cannot make an advance unless we can secure co-operation between the employer and the employee. In large industry this mutuality of interest that existed in small units cannot be restored to its former state without definite organization.

There has been a great increase in shop committees as a method of such organization. Where they have been elected by free and secret ballot among the workers, where they are dominated by a genuine desire on both sides for mutual co-operation in the shop, they have resulted in great good. One of the most important phases of that good has been the tendency to turn the aspect of some foremen from that of slave-driving to leadership. And a great good has been possible by the encouragement of men to creative effort, in the stimulation of their minds as well as their hands to the solution of these problems. It makes for pride of craftsmanship and is a real effort to offer them an opportunity of self-expression. Organized labor has opposed some forms of these committees because of the fear that they may break down trade organization covering the area of many different shops. There is economic reason for this fear in certain cases, deeper than appears upon the surface. One of the greatest accomplishments of organized labor has been the protection of the workers from the unfair employer, and it is worth the employer's notice that this is at the same time the protection of the fair employer from the unfair competition of the sweat shop. Again I believe the engineers could assist in the erection of a bridge of co-operation if organized labor, which has already made a beginning, would extend more widely its adoption of the principles of a shop committee, settling its problems of wage and conditions of labor in general agreement and applying its energies through shop committee organization to development of production as well as to the correction of incidental grievance. There would be little outcry against the closed shop if it were closed in order to secure unity of purpose in constructive increase of production by offering to the employer the full value of the worker's mind and effort as well as his hands.

There is an immediate problem in increased production that is too often overlooked by the theorist. While it is easy to state that increased production will decrease cost and by providing a greater demand for goods secure increased consumption and ultimate greater employment, yet the early stages of this process do result in unemployment and great misery. It takes a variable period of time to create the increased area of consumption of cheapened commodities, and in the meantime, when this is translated to the individual worker he sees his particular mate thrown out of employment. We accomplish these results over long periods of time, but if we would secure co-operation to accomplish them rapidly we must take account of this unemployment and we must say to them, the community, that if it is to benefit by the cheapening costs and thus the increased standard of living, or alternatively if the employer is to take the benefits, the entire burden should not be thrust upon the individual who now alone suffers from industrial changes. Nor can this be accomplished except by co-operation between groups. In fact, the whole problem of unemployment needs earnest consideration.

In summary, the main point that I wish to make is this: that there is a great area of common interest between the employer and the employees through the reduction of the great waste of voluntary and involuntary unemployment and in the increase of production. If we are to secure increased production and an increased standard of living, we must keep awake interest in creation, in craftsmanship and the contribution of the worker's intelligence to management. Battle and destruction are a poor solution to these problems. The growing strength of national organizations on both sides should not and must not be contemplated as an alignment for battle. Battle quickly loses its rules of sportsmanship and adopts the rules of barbarism. These organizations—if our society is to go forward instead of backward—should be considered as the fortunate development of influential groups through which skill and mutual consideration can be assembled for co-operation to the solution of these questions. If we could secure this co-operation throughout all our economic groups, we should have provided a new economic system, based neither on the capitalism of Adam Smith nor upon the socialism of Karl Marx. We should have provided a third alternative that preserves individual initiative, that stimulates it through protection from domination. We should have given a priceless gift to the twentieth century.

I am not one of those who anticipate the solution of these things in a day. Durable human progress has not been founded on long strides. But in your position as a party of the third part to many of these conflicting economic groups, with your life-long training in quantitative thought, with your sole mental aspect of construction, you, the engineers, should be able to make contribution of those safe steps that make for real progress.

EDITORIALS

The First Meeting of American Engineering Council of the Federated American Engineering Societies

THERE were represented at the first meeting of American Engineering Council, the managing body of the Federated American Engineering Societies, 50 per cent of the aggregate membership invited to join. Member societies represented 35 per cent and participating societies 15 per cent. The seventy-two delegates represented an aggregate of 60,000 engineers. Such a large representation indicates the widespread feeling of the need for such an organization and assures it a successful life.

Outstanding problems facing the convention were the choice of a city for headquarters, the definition of specific plan and scope and the selection of a president.

Washington was wisely chosen as the headquarters city. Washington is not the geographic center of the society representation nor does it offer quite the business possibilities of New York. But it is the center of national government and legislation, it offers the best opportunities for contact between engineers and government, the best libraries and records of industrial and economic questions, and its choice precludes the possible claim by the smaller societies that New York and the founder societies are controlling the F. A. E. S.

There are many problems which can be advantageously taken up by the F. A. E. S. Sixteen of them have been named and adopted under American Engineering Council's program of plan and scope. The first alone covers in a general way the objects of the federation and justifies its existence: "To serve the public interest by investigation and advice to all public governmental and voluntary bodies dealing with national economic problems." Service in the "Conservation of National Resources" is another of the tasks of large caliber included among the plans of the council. It offers a field broad enough and one so little understood that there will be no jealousy because engineers have taken hold of it.

There is no question as to the wisdom of American Engineering Council in electing Herbert Hoover president. Such action placed in the highest office of the newly formed federation, pledged to broad service, a foremost engineer who has been successfully carrying on programs of service, who is a statesman as well as an engineer and who is known throughout the world.

The basic problem, "Industrial Waste," was suggested by Mr. Hoover as a problem with which engineers seem especially able to cope. He included as industrial waste, waste in production due to intermittent employment, unemployment, strikes and lockouts; the dulling of the human mind by repetitive operations; and the aggregation of great wealth with its power of economic domination. The detached and analytic view of Mr. Hoover as concerns the relation of engineers to the great economic groups, "striving by political agitation, propaganda and other measures to advance group interest" is shown by a quotation from his address:

"This engineers' association stands somewhat apart among these economic groups in that it has no special economic interest for its members. Its only interest in the creation of a great national association is public service, to give voice to the thought of the engineers in these questions. And if the engineers, with their training in quantitative thought, with their intimate experience in industrial life, can be of service in bringing about co-operation between these great economic groups of special interests, they will have performed an extraordinary service. The engineers should be able to take an objective and detached point of view. They do not belong to the associations of either employers or labor, of farmers, or merchants or bankers. Their calling in life is to offer expert service in constructive solution of problems, to the individuals in any of these groups. There is a wider vision of this expert service in giving the group service of engineers to group problems."

It is of interest to note that only the previous evening Matthew Woll, vice-president of the American Federation of Labor, said:

"The viewpoint of the engineer is valuable because it is a viewpoint of a man whose position is such as to enable him to see the whole broad problem involved. He is in a position to know fully the value of being able to release the creative energy of workers to bring into play their interest and intelligence."

It appears that engineers may have much to do with adjustments of our great problem known as the "Labor Question," and if they do a large part of their work will best be done through the Federated American Engineering Societies.

The meeting of American Engineering Council was a success and the federation is now on its way.

L. C. M.

An Immigration Problem

ON another page will be found an article under the foregoing title, by William H. Barr, president of the Inter-racial Council. No one is better qualified to express opinions regarding matters of this kind than Mr. Barr. Some of the things he says should be carefully considered by our readers and by the next Congress. One of the most important is the modification of our immigration laws regarding the literacy test. At present thousands of good, honest workers are kept out and all too many educated radical agitators let in. These agitators, assisted by others of a like type here, are the cause of much of our labor trouble. We can sympathize with the worker who has a legitimate kick, but we have no use in America for the born trouble maker bred in the countries noted for this class. There is a vast difference between political freedom and political license, and those who believe in the latter should be sent back where they belong. On the other hand, every effort should be made to obtain the type of immigrant seeking political freedom and a home. E. V.

SHOP EQUIPMENT NEWS

- Edited By -
S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and equipment

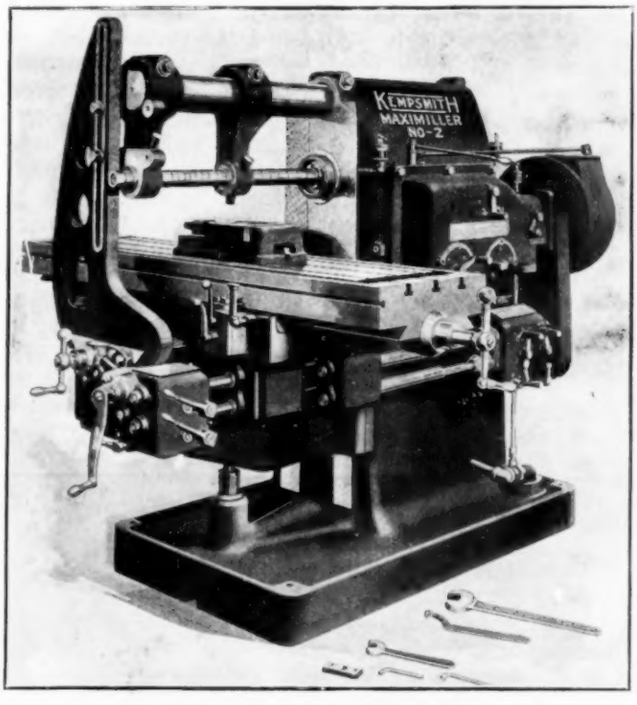
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs and equipment

Kempsmith No. 2 Plain Maximiller

In announcing the No. 2 plain maximiller type of milling machine, the Kempsmith Manufacturing Co., Milwaukee, Wis., states that the machine is similar in all points of design to the No. 4 plain maximiller, which was described in the *American Machinist*, Vol. 49, page 595.

The machine is intended to give rapidity and convenience of operation and efficiency in production. It is heavily made, as can be readily seen from the illustration.



KEMPSMITH NO. 2 PLAIN MAXIMILLER

Specifications: Working surface of table, 12 x 56 in. Table adjustment: Longitudinal, 28 in.; transverse, 10 in.; vertical, 19 in. Face of column to brace, 24¾ in. Arbor: diameter, 1¼ in.; length shoulder to nut, 22¼ in. Spindle: front bearing, 4½ in. diameter by 4⅞ in. long; taper hole, No. 12 B. & S.; hole through spindle, 1⅛ in. Driving pulley: 3½ x 15 in.; speed, 400 r.p.m. Spindle speeds; number, 18; range, 16 to 400 r.p.m. Feeds: number, 18; range, ⅝ to 25 in. per minute. Power quick traverse: longitudinal, 100 in. per minute; transverse and vertical, 36 in. per minute. Floor space, 85 x 105 in. Weight: net, 4,200 lb.; domestic shipping, 4,500 lb.; export shipping, 4,900 lb.

Heat-treated steel is used for the gears and heat-treated alloy steel for the shafting, while the column, knee, saddle and table are semi-steel castings. The column is ribbed internally and has few openings. A solid rib or cross member midway of the column height serves to form a reservoir for the oil used for the driving gears. The knee has a solid top, with the cross-feed screw in a shallow depression located centrally between the V's. Consequently, the cross-feed screw acts centrally on the saddle. The saddle is long and heavy with the drive to the table located near one end, thus leaving the center solid so as to give more rigidity.

The table has a working surface of 12 x 56 in. and is taper gibbed, with provision for locking. The overarm is a steel bar 4½ in. in diameter, and is held with a "wedge lock," which keeps the cutter arbor in alignment with the spindle. An outboard support of the open-side type permits easy access to the work. The spindle nose is so made that it can drive face-milling cutters in either direction. A spindle reverse has been incorporated in the machine. The friction-plate clutch is operated by a hand lever located at the front of the machine, forcing the plates together by a combined toggle and plain lever movement. The clutch is easily adjustable for wear. A brake is provided for quickly stopping the spindle.

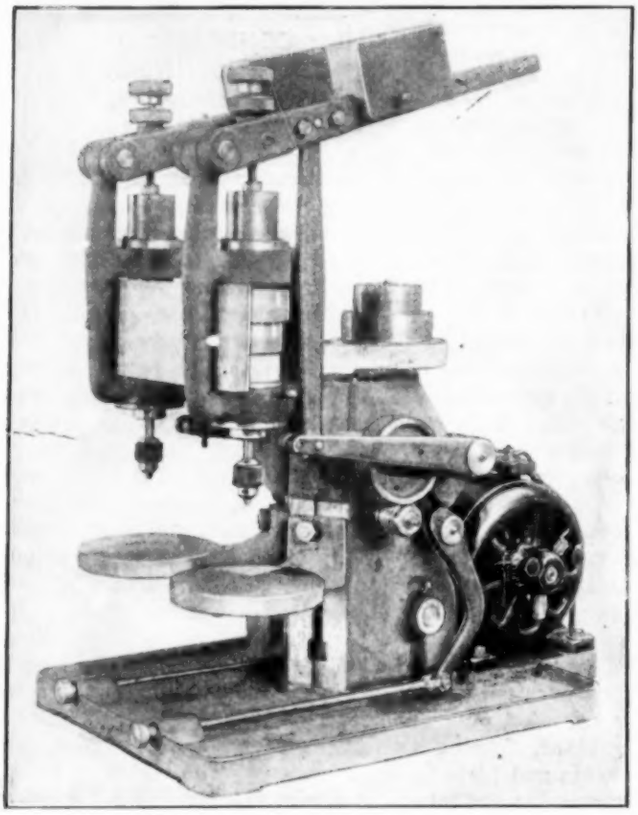
The longitudinal movement of the table is controlled by two levers, one for the feed and one for the power quick traverse. The movement is in the direction toward which the lever is thrown. Two levers located on the knee control both the knee and saddle movements; the movement actuated being determined by operating push pins located close to the hand-feed handles. The feed-change mechanism provides eighteen changes of feed in geometric progression. The power quick traverse can be used for moving the table without disturbing the set-up or the rate of feed in service, and is at the rate of 100 in. per minute. The power quick traverse for the cross and vertical travel is at the rate of 36 in. per minute.

All gears and bearings in the entire speed and feed mechanism either run in oil or are splash lubricated. Sight feed oilers are used for the spindle bearings and drive pulleys. The spindle runs in adjustable phosphor-bronze bearings, while all other shafts in the speed transmission run in ball bearings. A single pulley drive is used, the gearing giving eighteen changes of spindle speed. All speed changes are secured by sliding gears, and there are never more than three pairs of gears in mesh for any speed.

A centrifugal pump, engaged by means of a clutch, is provided for the coolant system. The machine can be furnished with motor drive arranged through a belt, the motor recommended being of 7½ hp., running at 1,200 r.p.m.

Kingsbury Automatic Sensitive Drilling Machine

The bench, automatic-feed drilling machine shown in the illustration has been placed on the market by the Kingsbury Manufacturing Co., Keene, N. H. The machine is intended for production drilling on small



KINGSBURY AUTOMATIC-FEED SENSITIVE BENCH DRILLING MACHINE

Specifications: Capacity, $\frac{1}{16}$-in. drills. Spindles: diameter, $\frac{7}{16}$ in.; standard stroke, $\frac{7}{8}$ in.; vertical adjustment, $\frac{3}{4}$ in. Vertical adjustment of tables, 5 in. Distance between spindles, 8 in. Spindle to column, 6 in. Bottom of chucks to tables, maxmium, 8 in. No. of speeds, 3; 1,500, 2,400 and 3,750 r.p.m. with drive-shaft speed of 750 r.p.m. Drive pulley, 5 in. Height, 28 in. Base: belt-drive, 16 x 20 in.; motor drive, 16 x 24 in. Weight: belt drive, 250 lb.; motor drive, 270 lb.

parts. Gravity feed is utilized, in conjunction with a mechanical control by means of which the operation of the feed is rendered automatic and "sensitive."

Both spindles are driven by the same belt running on vertical cone pulleys. The drills are held in Jacobs chucks, which are furnished as regular equipment. The feed of each spindle is independent of the other, the pressure required for drilling being supplied by the weights adjustably mounted on the arms at the top of the machine. The length of stroke of each spindle is $\frac{7}{8}$ in., a vertical adjustment being provided in addition.

To regulate the action of the feed, the mechanism shown on the side of the machine comes into play, it being the same for each spindle. The small, hardened, grooved friction-roll shown on the side of the column runs at constant speed. The large grooved wheel is mounted eccentrically on a pivoted arm, so that the weight of the spindle and of the counterweight keep it in contact with the small roll. The friction between the two wheels causes the eccentrically mounted one to rotate and thus raise and lower the spindle. A catch is so arranged as to relieve the wheel of the weight it carries as the spindle starts downward at the completion of a cycle, thus keeping it at the top of its stroke. To again start the feed, the knob on the front of the machine is pushed.

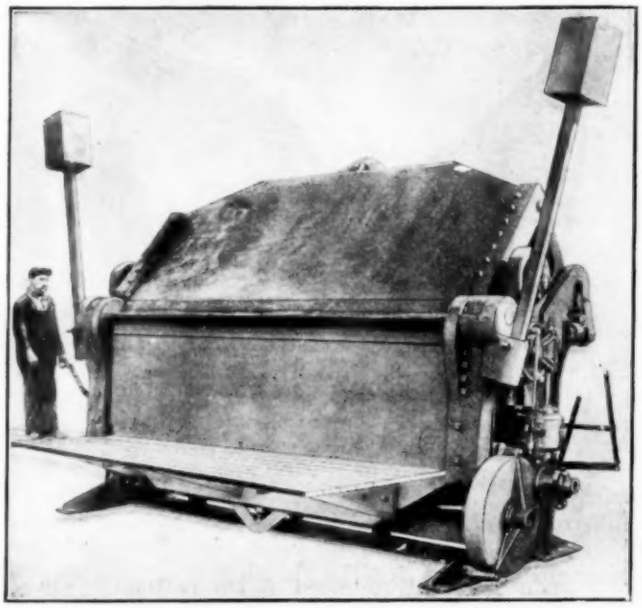
When the drill in moving downward strikes the work the weight is taken off the friction wheels, so that slippage occurs, and the pressure of the feed is derived from the weight on the arm of the spindle. When the drill breaks through the work, the spindle cannot drop because the friction wheels again engage and move it at the predetermined speed. This speed is ordinarily such that a complete cycle is performed in $\frac{1}{15}$ min. with no resistance in the path of the drill. Thus, it is necessary for the operator only to replace the work and to start the feed.

This machine can be furnished with a device which automatically warns the operator that the drill is becoming dull. The time allowable for drilling the work must be determined, a means of setting the mechanism for it being provided. If the drilling requires more time than that taken for the predetermined number of revolutions of the friction-roll shaft, a stop is actuated, so that the feed does not start when the knob is pushed for the next piece of work. The operator is thus warned to sharpen the drill.

S.K.F. ball bearings are used on the spindles, idlers and the vertical shaft, while Non-Gran bronze bearings are used on the horizontal shafts. All gears are of steel and placed inside the column, the bevel gears running in oil. Either motor or belt drive can be furnished. Floor stands, for either one or two machines, are made. It is claimed that the use of the machine lessens drill breakage, saves work on the part of the operator, and saves time by keeping the drill cutting.

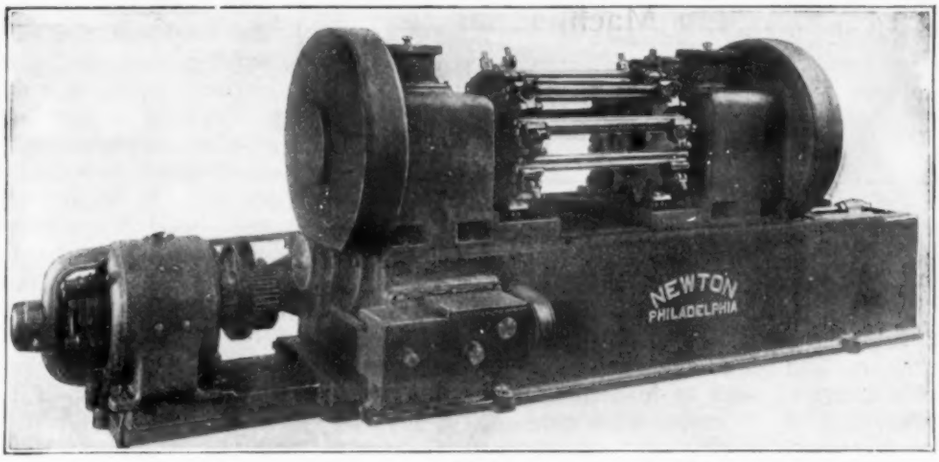
Dries & Krump Plate-Bending Brake

What is said to be the largest plate-bending brake in the world was recently built for the Newport News Shipbuilding and Drydock Co., Newport News, Va., by the Dries & Krump Manufacturing Co., Chicago, Ill. The brake weighs 30 tons, and can bend cold plates 12 ft. long up to $\frac{3}{4}$ in. thick. It is built of steel throughout, the main body being constructed of large



LARGE DRIES & KRUMP PLATE-BENDING BRAKE

steel plates braced with truss rods, the housings being steel castings, and the links which connect the upper and lower jaws being forgings. The nose of the upper jaw carries a tool-steel edge. The motor is mounted within the machine, driving a shaft carrying direct and reverse friction clutches. The reverse motion for lowering the bending leaf is obtained through an idler gear. The bending leaf is counterweighted. The upper jaw is raised and lowered by means of a manganese-bronze worm-gear. The clamps holding the plates are driven through friction clutches, no adjustment being required for various thicknesses of plates.



NEWTON MODEL 0-3 CONTINUOUS MILLING MACHINE FOR FACING

An adjustable dog is provided, which automatically stops the bending leaf for any desired angle on the work. Plates are free to pass between the housings, permitting bends to be made at any distance from the front or rear ends of the plate. Adjustment is provided for changing the radius of the work being bent. As sharp as 1½ in. radius can be bent on ¾-in. plates, and as large a radius as is desired.

It is claimed that the machine operates rapidly, the time consumed in making a right-angle bend being less than one minute. No dies are required for different thicknesses of metal, radii of bend, or degree of angle to which the plates are bent. The brake requires a floor space of 16 x 12 ft.

Newton Model 0-3 Continuous Milling Machine

The continuous milling machine shown in the illustration has been placed on the market by the Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia, Pa. It is known as the Model 0-3 and is intended for face milling the ends of such work as shafts, rods and crankshafts.

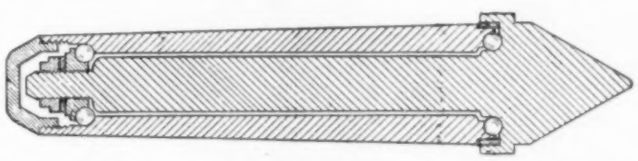
The machine consists of a heavy bed carrying two heads, one of them being movable along the bed in order to accommodate work of different lengths. An individual motor drive is employed, a shaft running through the bed transmitting power to both heads. The spindles, driven through worms and worm-wheels, are at the height of the center of the work-holding fixtures, being behind the fixtures in the illustration. End or face mills are used, an adjustment for varying the depth of cut being provided. All bearings of the machine are oiled by a cascade system.

The work is secured at each end in a fixture fastened to the head. The feed motion is obtained by rotation of the fixtures, which are driven by gears from a common pinion shaft, so that they move at the same speed. With the fixtures shown, the operator loads the machine and clamps the work in position. After the ends have passed over the cutters to machine the work to length, the handles of the clamps strike stops, so that the shafts are automatically released at the bottom of the fixture, and then roll down the inclined edges of the pans into tote boxes or to a roller conveyor.

The work-holding drum shown has ten stations, there being a considerable distance between each set of bars. In order to save time while the cutters are passing through the clearance spaces, a rapid traverse at a speed ten times the cutting speed is automatically put in operation when the cutters are running idly. It is stated that a production of 250 pieces per hour can be obtained with this arrangement, the shafting being 1¾ in. in diameter. Different sorts of work can be held by using different fixtures or drums. Where the pieces of work can be placed closely together, it is not necessary to use rapid feed in the clearance spaces, the feed being continuous. A coolant system can be furnished if desired.

Snellex "Frictionless" Center

The Snellex Manufacturing Co., Rochester, N. Y., has recently placed on the market a ball-bearing center. The device is intended to decrease friction between the work and the center, to make it unnecessary to regrind



SECTIONAL VIEW OF SNELLEX "FRICTIONLESS" CENTER

center points, and to eliminate the wearing and burning of center holes in the work.

The general construction of the center can be seen in the accompanying illustration. The ball race at the rear end is held in place by a lock-washer and check-nut, and it is protected by an oil cap. The device is regularly made in four sizes, from Nos. 1 to 4 Morse taper, other sizes being made to order.

Wilkes Toolholder

The Dawson Tool Corporation, 51st and Lancaster Ave., Philadelphia, Pa., has placed on the market the Wilkes toolholder, shown in the illustration. W. A. Schurmann, of the same concern, is lessee of the product.

The holder is intended for heavy-duty, high-speed work, the point of the cutting tool being supported by a projection of the holder underneath it. No setscrew is used to hold the tool, the clamping action being obtained by means of the nut at the rear end of the

WILKES HEAVY-DUTY TOOLHOLDER

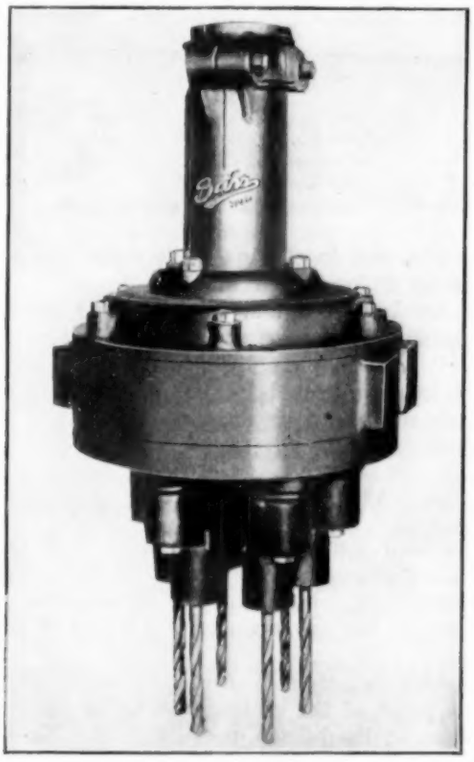
holder. Because of the absence of a set-screw, the front of the holder can be passed through the toolpost. It is claimed that the holder will stand very severe use, and that it holds the tool so securely as to decrease chatter. The body is heat-treated. The holder is made in a range of sizes to take tools from $\frac{3}{16}$ to 1 in. in size.

Buhr Multiple-Spindle Drill Heads

The Nelson-Blanck Manufacturing Co., Dubois and Clay Sts., Detroit, Mich., has placed on the market a line of ball-bearing, fully adjustable Buhr multiple-spindle drill heads. The illustration shows head No. 16-F, which has six spindles, although heads having any number of spindles from 3 to 12 are made.

The heads are equipped with detachable adapters and drivers. The drive is through spur gears from the main shaft to the spindles, each spindle being capable of being swung about the center of the spur gear driving it, and these centers, in turn, being adjustable in toward or away from the center of the head. Thus the range of positions in which the spindles can be placed is increased over the old type. Special arms can be furnished for close center distances.

The mechanism is completely inclosed, being dust-proof. Ball-bearings are used throughout. All moving parts are made of heat-treated chrome-nickel steel and run in light grease. It is stated that each spindle unit has three times the strength required to drive the maximum size of drill which can be used, thus making it possible to mount special arms carrying two or more drills, if necessary.



BUHR MULTIPLE-SPINDLE DRILL HEAD NO. 16-F

The head is manufactured with four capacities. The smallest, or high-speed machine, running at 5,000 r.p.m., is equipped with No. 1-A Jacobs chucks taking drills up to $\frac{1}{4}$ in. in diameter. The next size is equipped with No. 1 Morse taper holes in the spindles, and can handle drills up to $\frac{7}{16}$ in. in diameter. The heads having No. 2 Morse tapers will accommodate $\frac{5}{8}$-in. drills; while the largest size, having No. 3 Morse tapers, will carry drills up to $1\frac{1}{4}$ in. in diameter.

"I. T. C." Self-Loading Electric Truck

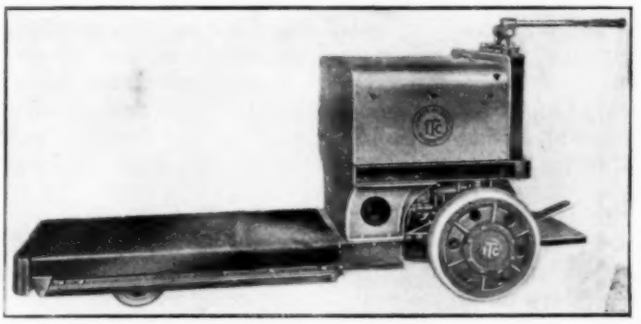
The elevating-platform electric industrial truck shown in the illustration has been placed on the market by the Industrial Truck Co., a division of the Cowan Truck Co., Holyoke, Mass. It is of all-steel construction and has a capacity of 5,000 lb., the lift being $4\frac{1}{2}$ in.

The lifting action is vertical and is said to be very rapid, requiring only 5 or 6 seconds to elevate the platform. Lowering requires only 3 seconds. The platform is operated by an independent heavy-duty, series-wound motor having a worm-gear speed reduction, and controlled from the driving end of the truck.

Steering is done on all four wheels. A single reduction is used in the worm drive to the power axle. It is claimed that the mechanism is easily accessible. The rear end of the truck is equipped with a bumper to protect the platform, and a draw-bar attachment to enable the use of the truck as a light-duty tractor.

The truck has a turning radius on the extreme outside point of 7 ft. 10 in. and is said to be capable of being operated in intersecting aisles 60 in. wide. By folding up the step and raising the steering handle the length of the truck can be shortened for use on elevators. A drum-type controller is used for the driving motor, three speeds being provided in both directions. It is necessary that the pedal on the step be held down in order to operate the truck. In case the pedal be raised while the truck is in operation, the circuit is broken, a brake applied and the truck instantly stopped.

Either alkaline or lead batteries can be used, the standard equipment being 21 Edison A-6 cells or 12 cells of the 15-plate Ironclad-Exide type, although batteries of greater capacity can be furnished.



"I. T. C." SELF-LOADING ELECTRIC INDUSTRIAL TRUCK

Specifications: Capacity, 5,000 lb. Loading platform: length, 55 in.; width, 26 in.; height lowered, 11 in.; height raised, $15\frac{1}{2}$ in. Driving motor: 24 volt; 50 amp.; 1,500 r.p.m. Elevating motor: 24 volt; 35 amp.; 1,800 r.p.m. Gear reduction, $17\frac{1}{2}$ to 1. Speeds: 3 forward, 3 reverse. Wheel diameter: driving end, 20 in.; trailing end, 10 in. Turning diameter: outside wheel, 14 ft. 3 in.; outside point, 15 ft. 8 in. Wheelbase, $59\frac{3}{4}$ in. Height, 51 in. Width, 36 in. Length: overall, 102 in.; step raised, $91\frac{1}{2}$ in. Weight: without battery, 2,150 lb.; with Edison battery, 2,600 lb.; with lead battery, 2,700 lb.

Wickman Universal Gage Measuring Machine

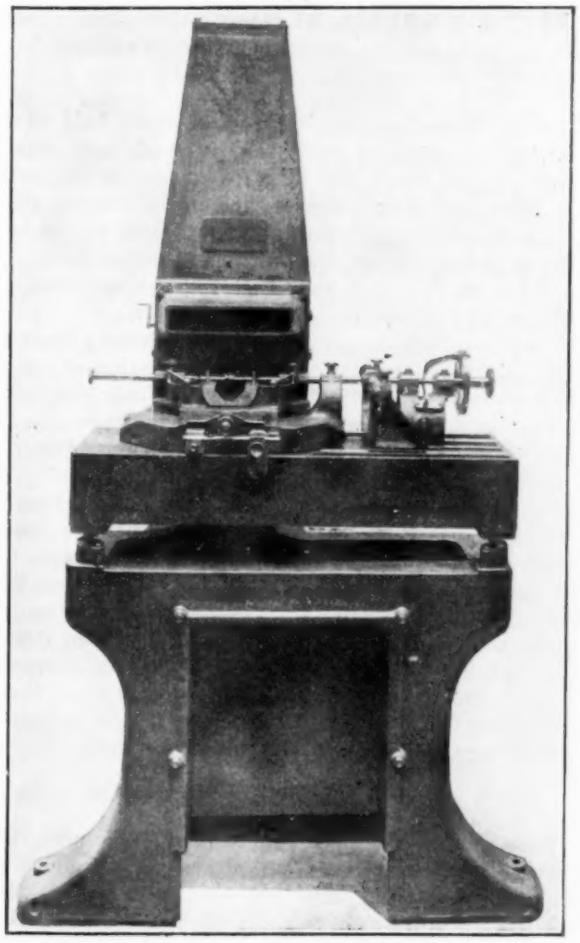
The illustration shows the Wickman universal measuring machine recently placed on the market by Alfred Herbert, Ltd., Coventry, England, and 54 Dey St., New York City. The machine is intended for measuring gages of all descriptions, the capacity being as follows: Length gages, up to 12 in.; outside, pitch and root diameters of screw plug gages up to 6 in. in diameter; pitch of screw plug gages up to 4 in. in diameter; outside, pitch and root diameters and pitch of screw ring gages up to 3 in. in diameter; and thread forms of screws up to 4 in. in diameter.

The heavy, ribbed bed is mounted on three points on the base. The measuring head is mounted on ways at the right of the bed. The micrometer screw can be calibrated against standard gage blocks, the operation requiring only about 5 min. By means of a compensating device on the head, any progressive error can be allowed for. A split nut is not used on the micrometer screw, and it is stated that the mechanism is so accurate that measurements can be repeated within 0.000005 in.

The carriage at the left of the bed has a longitudinal movement of about 4 in., being mounted on $\frac{1}{8}$-in. balls, of which there are three sets of three balls each, one set being at the front and other two in the same ways at the rear. The ways consist of hardened and lapped steel shafts $\frac{3}{4}$ in. in diameter, each way being made of two shafts. The top way at the front consists of a flat plate, so that the movement of the carriage cannot be constricted. It is stated that the carriage and its equipment, although weighing about 75 lb., can be moved by a force of $1\frac{1}{2}$ ounces, so that very light pressure between the anvils can be obtained. The ways are fastened to bosses on the bed and carriage, the castings proper not being machined, so that the warping caused by such a procedure does not occur.

The indicating mechanism is enclosed and situated in the rear of the carriage. The hood above it covers the lighted scale and is used merely to prevent outside light from affecting the illumination. The screw plug gage between the centers is measured by the use of a point or stylus which touches it. A special type of stylus is provided for the internal measurement of ring gages. There is a mechanical magnification of the deviation at the point of 60 to 1. The moving parts are made of duralumin, and the levers are fitted with vanes dipping in oil wells.

The mechanical magnification is then multiplied about 70 times by means of light, so that the total magnification of the movement of the stylus is 4,000 to 1. It is stated that the machine can work to an accuracy of 0.00001 in., or to 0.000005 in. when used as a comparator. It is said, also, that this accuracy does not depend upon any particular skill of the operator in taking readings, as the reading is made by fitting the projected shadow $\frac{1}{4}$ in. in diameter into a tinted section, an accuracy of only $\frac{1}{20}$ in. being required in so doing.



WICKMAN UNIVERSAL GAGE MEASURING MACHINE

Wickman Gear Pitch and Concentricity Measuring Machine

A machine for measuring and gaging gears is shown in Fig. 1, it being the product of Alfred Herbert, Ltd., Coventry, England, and 54 Dey St., New York City. It is known as the Wickman gear-pitch and concentricity measuring machine. It does not test the form of the teeth. The gear to be tested is mounted upon a mandrel which accurately fits its bore and which is held in the taper of the vertical arbor of the machine by a draw bolt. The arbor can be rotated by means of a worm and wormwheel, the graduated dial on the shaft of the worm being used to determine the amount of rotation of the arbor. The worm is mounted

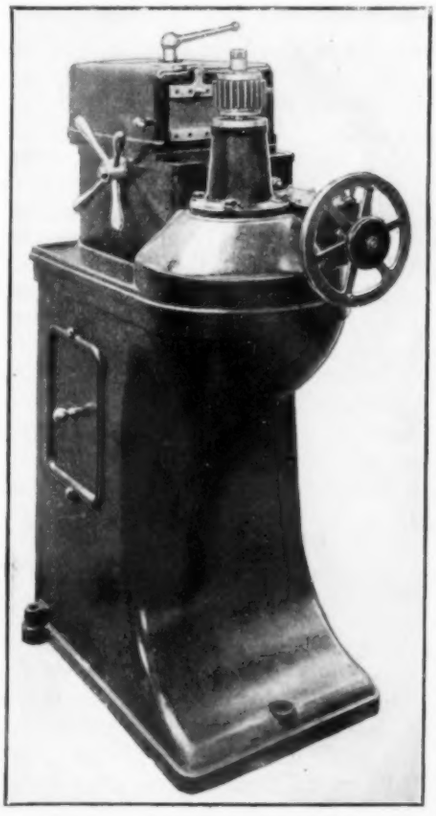


FIG. 1. WICKMAN GEAR PITCH AND CONCENTRICITY MEASURING MACHINE

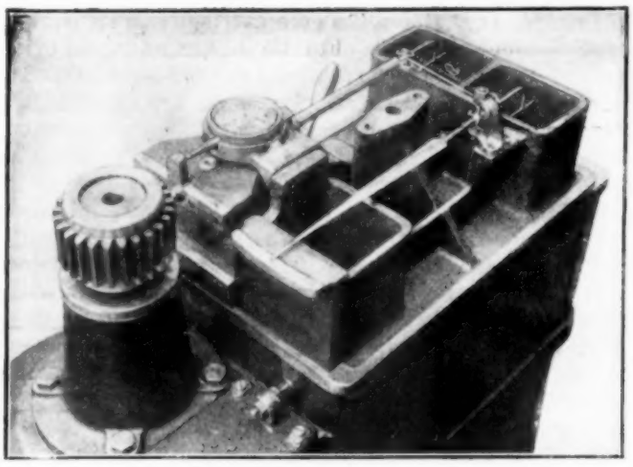


FIG. 2. INDICATING MECHANISM OF WICKMAN GEAR MEASURING MACHINE

on a slide having taper adjustments, so that backlash between the worm and wheel can be eliminated. It is stated that the worm and wheel are lapped to an accuracy in pitch and form of 0.0001 in.

The box mounted on ways at the top of the machine carries the gaging mechanism, a view of which is shown in Fig. 2, the cover of the box being removed. It will be seen that an arm pivoted near its center about a vertical axis carries a point or stylus, which fits at the pitch line the space between the teeth of the gear being tested.

In operation the carriage is brought forward until the stylus presses in the space between two teeth. By turning the worm, the long needle at the right is brought to zero, this needle being so connected to the arm carrying the stylus that the motion is magnified. In order to dampen the action of the needle, the vanes shown fastened to the ends of the levers are immersed in oil, which renders the mechanism dead-beat and free from vibration. The dial indicator on top of the arm carrying the stylus is then adjusted to read zero.

Quick Readings

The wormwheel is revolved, the stylus thus being brought in the next tooth space. When the long needle again registers zero, the reading of the graduated dial on the worm shaft is taken, this reading showing the true pitch of the tooth. The reading of the dial indicator shows whether or not the pitch diameter has changed, thus checking the concentricity of the pitch circle with the bore of the gear. The process is repeated for all the teeth, two curves being plotted from the data, one showing the pitch error between the teeth and the other showing the concentricity error. It is stated that a gear having 30 teeth can be tested and its curves be drawn in less than 10 minutes.

The device is intended chiefly for testing one gear from each lot, both before and after hardening, rather than for testing every gear. Gears from 2 to 12 in. in diameter can be tested. It is stated that the machine is to be provided with a vertical adjustment of 6 in.

Our Immigration Problem*

By WILLIAM H. BARR
President, the Inter-racial Council

THERE are some people who have been demanding that the "gates be closed" to immigrants. They insist that our country and our institutions are endangered by immigrants. That attitude, backed up by what has amounted to a campaign against the foreign born during the last two years, and by proposed legislation to shut off immigration, and by enacted State legislation barring immigrants from certain occupations in certain states, was one of the principal reasons for the enormous outflow of immigrants from America following the armistice, when more than 400,000 loyal, able-bodied immigrants left this country and no male immigrants were coming in to replace them.

If there has been any danger to America, it has not been from the immigration of the foreign born to this country. The danger has been from the departure of foreign born, from the lack of sufficient numbers of foreign born workmen in the industries that depend upon foreign born labor, from the restrictionist attitude of some of our people, and from the indifference of American business.

There are more than 10,000,000 foreign born workmen in this country, working on jobs in the cities. Those of foreign birth and parentage represent only one-third of the people of the United States—yet, they mine three-fourths of the coal, manufacture three-fourths of the clothing, half of the silk, linen, wool, lace and embroidered goods; bake more than half of the bread, refine more than half of the sugar, and put up half of the canned food. They have built our railroads with the aid of American capital, and still do half of the maintenance work on both the railroads and streets. Half of the work in the blast furnaces, in the carpet mills, hemp and jute factories, and in the copper, silver, brass, gold, rubber and leather goods—half of the work in those industries is done by the foreign born, and two-thirds of the iron and steel for the railroads, for buildings and ships is produced by them.

To what extent would this country have progressed if during the last twenty years the admission of foreign born had been prohibited? Who would man the mines, the iron and steel mills and foundries, the machine shops, the silk mills, the knit goods shops, the glass factories, lumber mills, and other industries? Our native-born workers are largely skilled workmen—as they should be—and we cannot look to them to provide the industries with the primary grades of work. We must look to the foreign born to provide the unskilled labor. If this class of labor is not forthcoming, how can the wheels of industry turn around? How can the skilled workers find employment if the basic work is not performed? We cannot build houses unless the excavation is dug; we cannot operate trains unless the roadbeds are constructed and the tracks laid.

Opposition to Immigration

There are some people who would stop immigration entirely, regardless of what it would mean to this country, who would shut off this necessary flow of unskilled labor into America. They would shut it off, because of the alleged lawlessness of foreign elements and

*Address before the Philadelphia Chamber of Commerce.

because of the fear that the foreign born may not be loyal to this country and to American institutions. As to the alleged lawlessness of the foreign born, it may surprise us to learn that in the report of the Provost Marshal General, referring to the war, it is stated that of the foreign born who registered for the draft, a percentage of one and four-fifths was reported for desertion. The percentage among the native born reported for desertion was three and one-fifth. The foreign born serving in the army were less inclined to overstep the barriers of army discipline. Yet, we hear it said time and time again that the foreign born are a lawless and disloyal element and a bad lot.

In the question of loyalty, the recent war afforded striking evidence of the whole-hearted service of our foreign born, who poured out their life's blood on the battlefields. From a population of only one-fifth that of the native born, the foreign born gave one-third of the overseas fighting men. They over-subscribed their loan quota every time. They supplied one-half of the workers in war industries. Acts of heroism performed by foreign-born heroes in the American army were numerous. This talk of disloyalty is nothing more nor less than the old Macedonian cry over again, or the cry of the time of Caesar when all aliens were barbarians. Those who raise this cry warn us that the "barbarians" must be barred out of this country. They tell us we have already received more immigrants than is good for the country.

Turning to the discussion of our present volume of immigration, we again find the tendency to disregard facts and to manufacture false arguments. The columns of the newspapers the country over have been filled with articles relating to a supposed enormous volume of immigration. Nearly every week an announcement is made about some record-breaking inflow of foreigners, and interviews are published that predict a glut of labor on the American market.

Let us consider the character of the immigration now coming to this country. It includes an extraordinarily large number of women and children and old men, who are fleeing destitution in Europe. These women and children and old men are not coming for the purpose of engaging in industries. They are coming to join relatives who sent for them. They mean nothing at all to the industries, although it is not unlikely that they may exert a stabilizing influence on the foreign born whom they are coming to join.

Of the able-bodied males who are arriving, many are returning reservists who have rights of residence in this country, and who intend to go back to the jobs they left behind them when they responded to the call to arms of their motherland overseas. The present volume of immigration may be large, as compared with dull periods of immigration. But there is every evidence to show that the present immigration is not in the nature of an industrial invasion. The supply of unskilled labor from the present influx will be very limited. Although unemployment is reported in certain industries, and in certain localities, the demand among the general run of industries for unskilled labor is still urgent.

Analysis of Immigration Figures

The flow of unskilled labor to the industries was shut off for the period of the war. And following the armistice, the movement of foreign-born workers was *away* from America, and not *to* America. Before the war, more than a million immigrants were coming in annually. About 300,000 were going out, leaving a net gain of more than 900,000. For the fiscal year ended June 30 last, the permanent net increase in our alien male population was merely 9,877. That fact is revealed by an analysis of the official figures of the Bureau of Immigration. More aliens left America in the last fiscal year to remain permanently in Europe than were admitted from European countries. The total increase in the alien female population (135,246) was more than thirteen times as large as the increase in the permanent alien male population.

From these statistics, and from the fact that the present immigration is composed of large numbers of women and children and old men, it would seem that the present talk that we are being overwhelmed with immigrant labor is misleading.

Let us turn to the arguments that are advanced by those who are constantly harping upon the numbers of immigrants now coming in, but who do not go to the pains of analyzing the figures to determine the numbers of unskilled workers among those immigrants. The first argument is that the immigrants will underbid the American workers in the labor market. I stated earlier in this address that the American workers are largely skilled, whereas the foreign-born workers in America are largely unskilled. How can there be any competition between these two classes of workers? If the immigrant workers are graduated to the semi-skilled or skilled grade of work, they get the prevailing wages for that work. There is no competition and no underbidding. I have always been at a loss to understand upon what grounds the argument that the foreign born underbid the native born is based.

We are told also about the menace of hard times, and the laying off of men in the industries. We are informed that this condition will increase with a great horde of immigrants, and that with the bad conditions in Europe, the tide of immigration will rise and rise until America is virtually overwhelmed with people from Europe. You will note the use of superlatives by immigration restrictionists. Always they speak of hordes.

Answers to their arguments are simple. The laying off of men is a temporary condition, and cannot be made the basis for a permanent policy on immigration.

There is nothing new about the argument against immigration, based on hard times. We seem to forget that the immigrant comes here to better his economic situation. That being true, is it likely that the immigrant will migrate to America in time of industrial depression when jobs are scarce, and money is not available for wages? Immigration diminishes in periods of bad times. The statistics of the Bureau of Immigration show that to be the case. They show also that the unstabilized foreign-born labor in America moves out of the country when an industrial crisis is threatened. There is no danger of such a crisis in this country now. I insist there is ahead of us a period of unprecedented prosperity.

When long-term credits have been established and the exchange is back at normal, our exports will take an unprecedented jump. But they will take that jump only in the event that we have sufficient labor on hand to manufacture for foreign as well as domestic needs. If the labor supply is inadequate, then we will have to let the foreign market "go to the dogs," for we will be fortunate indeed if production keeps pace with the needs at home. Our industries will resume operations approaching capacity, and there will be a pronounced

shortage of labor, due to the non-industrial character of the people coming in and because of the industrial character of the aliens going out.

The bad conditions in Europe that are referred to will not drive immigrants here indefinitely. Europe will not always be starving. Europe, of necessity, must get back on its feet again. Political and race persecution will come to an end, and these two things have been responsible for a large part of our immigration of the past. Today, few immigrants are coming to this country for freedom's sake. The European countries have won their independence as a result of the war. They have their own little nations and they are in process now of reconstruction.

Periods of reconstruction are invariably fraught with disturbances and with hard living conditions, and at the door of these things we lay the increase of immigration during the last few months. The future holds in store for the present of Europe advanced legislation and concessions of land. These things will militate against emigration from Europe in the future.

Stabilizing Immigration

Don't bank on a ceaseless flow of immigration. The time may come when we shall have to wish for it. What we must do is to endeavor to stabilize the foreign born now in this country, to try to induce them to remain here, to convince them that they should establish their homes in America and become good Americans.

If it is worth while admitting the immigrant, it is worth while attempting to have him stay permanently and become a citizen. For too long a time we have left the immigrant to shift for himself.

We have compelled him to seek employment unaided and without information as to localities where jobs are available. He has had to rely upon his countrymen in America for information and guidance, and the result is that he has gravitated to one or the other of the racial communities scattered over the country.

We have allowed the immigrant to get his impressions of American life through his experiences with unscrupulous people who have attempted to exploit him. We have left him to the mercy of dangerous ultra-radical agitators who at least pretend to take an interest in him, and, finally, we rail at the immigrant if, after a few years in America he has not applied for citizenship papers, and has not taken on some of the outward appearances of a native-born American.

There has been a lot of nonsense about the Americanization of the immigrant. Some people conceive Americanization as the waving of flags, and singing of patriotic songs. The way to Americanize the immigrant is to insure him steady work and to obtain for him square treatment on the job and off the job; to provide him with facilities for learning the English language, and to give him the right kind of an industrial start. These things coupled with protection and with a decent sort of attitude, will do more to make the immigrant love America than all the patriotic activities put together. Americanization is not a task for sentimental philanthropy. It is a man-size job, and a job that devolves rightly upon clear-headed business.

Certain things are necessary in bringing about the assimilation of our immigrant population. We must accord the immigrant, first of all, a proper reception on his arrival. There should be some way of getting to him information about jobs in various parts of the country, the conditions of work and the amount of compensation. We should have a service of distribution functioning both in Europe and in America. Before embarking on the other side, the immigrant should be informed where the best opportunities exist in this country, and every effort should be made to scatter the immigrants throughout the United States, so as to insure that all localities requiring immigrant workers shall get the benefit of their labor. Incidentally, this would have the effect of checking the growth of the racial communities that have grown up because of our neglect in the past to provide adequate Federal machinery for distribution.

Information for Immigrants

At Ellis Island, where 90 per cent of the immigrants are admitted, there should be a competent staff to assemble information from all parts of the country concerning opportunities for employment, wages, and other data useful to the foreign born. The staff of the department should be under the direction of a non-partisan official, serving, say, as an assistant to the Commissioner of Immigration, and acting in the interest of the industries of the United States—not for a certain group of industries, but for all the industries that require foreign-born labor. Our immigration should, first of all, be made to serve the productive needs of the nation.

Scientific distribution will help those productive needs, but I would suggest other steps besides scientific distribution. I would suggest that our Department of Labor send representatives to Europe to select the kind of immigration that is most assimilable and that best suits the industrial requirements of this country. At the present time our immigration machinery is inadequate. It has no facilities abroad; it depends upon the consular offices, which are part of our State Department, for whatever investigations into immigrant applications for passports are necessary. The situation is taxing our consulates in Europe, and the original purpose of those consulates—to gather business facts of interest to our business men—is being lost sight of.

When the immigrant is admitted we must take steps to protect him and to educate him. We should educate him as to the opportunities in America. We should show him where safety and profit exist, on the one hand, and, on the other hand, where danger lurks in the form of ultra-radicalism, violence and disorder.

We have seen the ultra-radicals spreading their doctrines of violence and revolution, while American business men have been placidly about their business, not realizing that they were sitting on top of a volcano. Revolutionary agitators have been boring from within in the labor organizations; they have been running magazines and papers in English and in foreign languages.

It is conservatively estimated that the I. W. W. sells $300,000 worth of literature a year. What has the American business man been doing besides giving inspirational addresses, and besides playing with amateurish experiments in Americanization? If the American business man were awake to the situation he would go about the business of combatting ultra-radicalism and revolutionary propaganda as systematically as he has gone about his own business enterprise.

The foreign born can be reached effectively in several ways—through their organizations, through the press, and through the individual plants. Recognizing that fact, a number of business men formed the Inter-racial

Council a little over a year ago. The council today is composed of more than 1,100 of the leading industrial establishments in the country, and conference groups from among thirty-two of the races in the United States. These two elements in the council have been working together in the interests of good, wholesome Americanism, and they have been directing their efforts through three channels:

First—Through the foreign language press, with news and advertisements relating the impracticability of Bolshevist theories, and the real meaning of American democracy.

Second—Through the English language press for the purpose of eliminating racial antagonisms, which are fertile soil for the seed of Bolshevism.

Third—Through the individual plants, by means of surveys by experts who know the races and their psychology.

The council is endeavoring also to impress the American public with the necessity of applying scientific principles to immigration. It is striving to create a new view point of the subject, to develop public knowledge of its importance to the prosperity of the country, and its relation to industry and citizenship.

That immigration is of paramount importance to American prosperity is beyond question. Since the foreign born came to this country in large numbers, beginning in 1850, the wealth of the United States has grown from less than ten billion, to over one hundred billion dollars; the money in circulation has increased from less than three hundred million to five billion; the deposits in savings banks have grown one hundred times as large and exports have jumped from one hundred and forty million dollars to many growing billions.

Since the immigrants arrived in large numbers, wages have increased twenty times, and the value of the products produced have jumped from one billion to twenty-five billion dollars.

The Inter-racial Council has been stating these facts to the country through the newspapers, and syndicate services, through trade journals, house organs, through addresses before business organizations, and groups of leading influential men. But it has not been doing half enough; it has not been doing one-tenth of its job, and why? Because this is a big job, requiring the support of the entire business field, requiring an organization extending all over the United States and ramifying into all of the leading cities of the country.

Until such time as the Council can command the unified support of American business, it will go on hitting the high spots, at least, and will continue to refute the ridiculous arguments of restrictionists who would limit the progress of America to the gait of a lame pedestrian. One thing it will not fail to do will be to point out the foolish character of much of the legislation in various States that prohibit the foreign born from engaging in certain occupations. We have proclaimed in our Declaration of Independence that all men were created equal; that they were endowed with equal rights, among them life, liberty and the pursuit of happiness. We state those things in our Declaration of Independence, but we enact laws in our state legislatures denying the foreign born the right to pursue happiness. In the State of Pennsylvania, if the children of a foreign born resident have a dog, he must shoot it or otherwise get rid of it. In Pennsylvania and other states, an immigrant may not secure a job on public works. In Wyoming he is forbidden to be a guide in the mountains; in Virginia he may not be a junk dealer, and in Florida, Virginia, Texas, Washington and Ohio he may not sell fish or oysters. In Michigan he may not become a barber. I could cite a score of other instances of discriminatory laws against the foreign born.

Then there is the literacy test, which bars admittance to immigrants who cannot read and write 40 words in any language. This test may keep out the illiterates who may be, and often are, very intelligent; it does not keep out the potential crooks, and revolutionary agitators who, as a rule, can read and write in several languages. There is the regulation which bars the stimulation of immigrants. This regulation is so worded as to prohibit the dissemination in Europe of information relating to opportunities and conditions prevailing in the United States.

What about legislation on the positive side, instead of the negative? What about an up-to-date twentieth century policy that will consider things in a common-sense way—a policy that will provide for information, protection, selection and distribution and that will handle the immigrant from the time he embarks aboard ship until he is settled down in his job in America. This is a business proposition. The best interests of American business require that such steps be taken. American business has been passive on the subject if not indifferent to its best economic interests.

The steps that ought to be taken in the interests of our immigration are well defined. It is not a question of hitting in the dark as we have on many other occasions. For over a year every phase of this subject has been studied thoroughly by the Inter-racial Council, which has assembled these facts from all over the world. It knows what must be done, but these things cannot be done without the co-operation of the business bodies; it cannot be done without the expenditure of funds in the interest of education and information. These things will not take care of themselves.

The agency already exists for planning; for getting the people together; for presenting the proper viewpoint; for mobilizing the facts—that agency is the Inter-racial Council, and I commend it to you for your whole-hearted co-operation and support.

Expanding Punch for Aluminum Ware

By John Lindgren

On page 615 of the *American Machinist* J. R. Sheppard asks why a hydraulic press is not used instead of the expanding punch for producing panels on aluminum ware.

There are several reasons, perhaps the most important of which is the extra time required. A two-piece die, such as he mentions, has been tried on the operation, using a rubber filler instead of hydraulic pressure with fairly good results; but difficulty was encountered in supplying a locking mechanism strong enough to hold the pressure and at the same time be easily operated.

It is doubtful if a shell could be expanded by the hydraulic method so as to save a spinning operation, for the reason that the body of the utensil is larger than the neck, and in expanding a drawn shell from, say 4½ to 6 in., the metal would continue to stretch at its weakest point till it broke.

A spinning operation would be required anyway, to take care of the trimming and beading.

The Situation of the German Machine Industry

A close survey of the present situation of the German machine industry shows a slight improvement. Reports from various industrial centers would indicate that the utter stagnation which obtained up to a few weeks ago has given way to an increased activity which is more or less marked in the different branches. One of the industries reporting improved business is the textile machinery line while the sewing machine branch is likewise doing better than in the beginning of the year.

An inquiry among manufacturers as regards prices would show, however, that a reduction of sales prices in the near future appears unlikely in view of the fact that foundries are unable to reduce prices owing to the high prices for iron imported from abroad.

The situation in the machine-tool industry still remains unsatisfactory, though in this industry, too, a slight improvement has been noticeable. Many concerns report a decided activity so far as inquiries are concerned, but the number of deals closed is still meager on account of the reticent attitude of consumers, who firmly believe in an imminent break of prices. Manufacturers, on the other hand, strongly deny the possibility of a reduction of prices in the near future on a scale worth mentioning. Another interesting feature of the general situation is the marked absence of foreign orders for German machine tools, which is generally explained by the overstocking of foreign markets.

The agricultural machinery and implement industry is severely affected by adverse conditions. Sales are lacking and a number of factories are working part time only, while some works have even closed down altogether. Foreign orders are scarce owing to the overstocking of warehouses, and the negotiations between the Allies and Germany for the purpose of placing orders with the German industry have not advanced beyond the initial stage as yet. Although the present time of the year was never conspicuous for lively business the fact should not be overlooked that the stagnation of business in this industry is rather marked. Practically the same applies to the woodworking machinery line as well as the electrical machinery and apparatus industry, where business on a small scale only is being done.

The bicycle industry is also complaining about the scarcity of orders, and this in spite of the recent reductions of prices.

A War Memorial

As a recognition of its employees who served either at home or abroad during the great war the Brown & Sharpe Manufacturing Co., Providence, R. I., has issued a worth-while memorial in the form of a splendidly printed volume of ninety-five pages, bound in a substantial manner. These books have been distributed first to the families of the nineteen who lost their lives, second to all of the 911 who saw service and who could be located, and finally to the several thousand employees now with the company who served during the war period. It has been impossible to locate all of the boys who went into the service and if any of these who read this will communicate with the Brown & Sharpe Manufacturing Co. they will receive a copy which has been reserved especially for them.

The book is illustrated with a color frontispiece, showing the service flag and a portrait of each of the nineteen who died in service. There is a note of appreciation from Henry B. Sharpe, which refers to the patriotic endeavors of all the employees during the crisis and expressing the thought that the whole record is one to which everyone will look back with pride in the years to come.

The volume has been prepared with extreme care, not only as to text but also its illustrations, arrangement and general appearance. It makes a highly commendable appreciation of the services rendered and will be treasured by those who formed a part of the Brown & Sharpe organization during the war.

Steel Fabricating Corporation Building New Factory

The Steel Fabricating Corporation, of Harvey, Ill., is building a new plant at Michigan City, Ind., to provide for the increasing demand for its sectional steel buildings. These buildings are designed according to the best engineering practices and are built for strength, service and satisfaction. The trusses, for example, supporting the roof are of the standard Fink type hot riveted throughout, the same as are used in the heaviest engineering jobs, such as skyscrapers and bridges. These trusses not only support the roof but will carry extra overhead loads, such as line-shafting for running machinery, or trolley conveyors for distributing materials around the factory, up to three tons without additional bracing.

The new factory will cover more than two city blocks and a half mile of switches in and around the plant have been installed.

Soviet Russia Places Big Order in United States

Following are the commodities, with the quantities, that Washington D. Vanderlip says the Russian Soviet Government has ordered from him and to supply which, he asserts, he will organize a Pacific Coast syndicate:

"Five thousand locomotives, 50,000 box cars, 2,000,000 tons of rails and rail fixtures, 2,100 gasoline and steam tractors, 1,000,000 plows, harrows, cultivators, drills, mowing machines, threshers and binders, 1,500 gasoline tractors, 2,000 linotype machines, 2,000 lathes, 500 steam boilers, 300 water turbines, 350 narrow gage locomotives, 50 generators, 350 gasometers, 10,000 automobile trucks and cars, 50,000 electric motors and dynamos and 7,000,000 tools.

"Three hundred thousand tons of metals, lead, tin, babbitt, antimony, etc., 50,000 tons rubber, 30,000 tons binder twine, 25,000 tons cocoa and coffee, 100 excavators, 500 steam engines, 100 oceangoing steamships of 10,000 tons and upward, 2,000 river steamers, motor boats and launches, 500 electric locomotives, 10,000 airplanes, 2,500 passenger cars, 5,000 street cars, 50,000 tons axles and tires, 5,000 sets of pumps and accessories, 30,000 sets of telegraph and telephone apparatus and 5,000 automatic block system sets.

"A thousand grain storing elevators, 10,000 cold storage plants, 250 dredgers for gold mining, 1,000 railroad excavators, 250 dredgers, 1,000 powerhouse installations, 100,000 tons of tool steel, 50,000 typewriters, 50,000 weighing scales and measures.

"Two hundred seventy thousand tons cotton, 6,000,000 tons coal, 25,000,000 pairs footwear, 50,000 tons leather, 125,000 tons hemp and flax manufactures, 500,000,000 cans condensed milk, 500,000,000 cans meat and other canned goods.

"Thirty-five thousand tons of resins, 1,000,000 tons copra, 10,000 tons joiners' and turners' precision work, 60,000 tons saltpetre, 20,000 tons chemical products and materials, 160,000 tons tanning materials, 60,000 tons dyeing materials."

—*New York Herald.*

Railroad Income Short

The Bureau of Railway Economics announces that the net operating income for September of Class I railroads of the country fell approximately $29,343,000 or 26.9 per cent short of the amount expected under increased rates. This figure is based on reports from 207 railroads of that class having a total mileage of 237,899 miles.

LD'S INDUSTRIAL FORGE
News Editor

Money and Markets

Credit Situation

The country's credit requirements have, during the period under review, reached a maximum level. Pressure may for a time continue at this current high level but no substantial increase is anticipated in the demand for banking accommodations, either for crop financing or to meet commercial and industrial requirements. The credit position is essentially sound and the future is to be regarded with confidence.

The banks and reserve institutions have financed the enormous volume of current requirements with no weakening of their reserve strength. The beginning of a reduction in the aggregate of these requirements is now evident. Loans of reporting member banks of the reserve system expanded steadily until the middle of October. A moderate contraction is now shown. Interior banks in diverse sections of the country are moderately increasing the volume of their purchases of commercial paper, an evidence of the release of funds from other employments. They have also begun, in a small way, to reduce their borrowings with other banks. Such contraction as has occurred is not of large volume. It is important, however, because in the present difficult situation it indicates an ability greater than might have been anticipated on the part of both the interior banks and their customers to liquidate outstanding obligations.

Money Rates

Open market rates on commercial loans have continued unchanged on an 8 per cent level, with country banks purchasing paper in fair volume. Call money was tight, ruling throughout most of the period at from 9 to 10 per cent, but easing at the close to 7 per cent. The continuing high rates in the call money market reflected the general stringency of credit rather than the requirements of the stock market, where sharp liquidation continued throughout the period. Moderate offerings of time money may reasonably be expected shortly, as funds are released from other uses. This would result in lower quotations. Prime bank acceptances were in active demand in reduced supply.

General Conditions

The determining factor in the entire situation continues to be the reluctance of consumers to buy, partly because of their expectation that prices may go even lower, and in part because of the curtailment of purchasing power of large sections of the buying public. Farmers are not purchasing actively at present because prices of the products which they have to offer in exchange have declined sharply. Wage earners hesitate to purchase because their earnings are being curtailed by increasing unemployment and in some cases by reduction in wages.

The adjustment of prices to new conditions of supply and demand has proved difficult. Two factors on the buying side of the equation offer much encouragement, however. In comparison with those classes whose income increased rapidly during the period of rising prices, the decline in prices which has already taken place has increased the purchasing power of salaried employees and persons in receipt of fixed incomes from investments. Large crops assure a fair volume of buying throughout the agricultural parts of the country, especially the grain states. Farmers unquestionably are delaying their purchases until the prices of what they must buy approach the level at which they must sell their crops. As that level is approached they will buy in increasing volume, because their position is essentially sound.—*National Bank of Commerce in New York.*

Steel Products Engineering Co. Buys Averbeck Patents

The patent rights and tools of the Henry J. Averbeck Shaper Co., of Covington, Ky., have been purchased by the Steel Products Engineering Co., of Springfield, Ohio, for the purpose of manufacturing the Averbeck shaper on a big production scale. Henry J. Averbeck was president of the company and was also inventor and designer of the shaper. He and his brother Lawrence will continue in general machine-shop business at their present address, having kept their standard machine-shop equipment. The Steel Products Engineering Co. also manufactures airplane motors and a universal gage grinder.

Georgia To Make Pig Iron?

The special train of the Georgia School of Technology with about 150 prominent business men of Georgia aboard left Atlanta Wednesday afternoon, Nov. 17, for an industrial tour which included inspection of industrial plants in the cities of Cincinnati, Buffalo, Niagara Falls, Pittsburgh, Boston, New York and Washington. One of the main purposes of the tour was to inspect iron and steel plants in the above named cities with a view to establishing blast furnaces in Georgia to make pig iron from ore mined in that state. All Georgia-mined iron ore is now sent outside the state for this purpose as there are no furnaces there.

Cancellation of Orders Affecting Our Standing Abroad

Order cancellations, the repudiation of contracts and the protesting of irrevocable credits on technical grounds by some American import concerns have lately assumed such proportions that they threaten to jeopardize the standing of the United States in the markets of the world.

These practices (according to the Guaranty Trust Company of New York in "American Goods and Foreign Markets," its semi-monthly survey of international trade), whatever justification they may or may not have, present the most serious feature of American foreign-trade relations today. They have been resorted to in most cases because the recent decline in commodity prices has occasioned substantial losses to importers here, who, consequently, are endeavoring to relieve themselves of obligations entered into with foreign houses.

American business men, on the other hand, complain that contracts abroad have been cancelled even oftener than in this country, and that infractions of the rules of business ethics are less common here than abroad.

The following letter from a prominent Far Eastern bank is a typcial expression of the general dissatisfaction in foreign fields over the situation:

To our extreme regret we must inform you that lately both banks and merchants here feel some uneasiness concerning the possibilities of continuing the close business relations which were established with your country during the war and which until recently have developed to the satisfaction of all concerned.

This uneasiness, which we are sorry to observe almost everywhere, is due to unfortunate experiences of late regarding the attitude of American buyers toward their business contracts.

Refusals by American banks to honor drafts drawn under their letters of credit because of quite insignificant deviations from the usual wording of letters of credit have recently occurred again and again, notwithstanding that the bankers have immediately offered guarantees of redress for such small inaccuracies. Obviously, these refusals were instigated by American buyers, and one cannot help feeling inclined to attribute the attitude of American banks to the changed attitude of American merchants.

Although it may be that such methods are practiced only by merchants who have already acquired repute in your country for unsympathetic commercial principles, you will readily understand that the victims here naturally generalize in their conclusions, and thus great harm is being done to the development of our trade with America.

The exchange banks in Java, under the circumstances, are reluctant to take American bills. Hence, the extent of our business relations may be seriously affected, which we are trying our best to prevent.

We deem it our duty to draw attention to these facts, and trust that they will bring home to American importers the fact that such acts as those mentioned in the foregoing ultimately will prove seriously detrimental to American business relations abroad, the growing extent and intimacy of which we have been watching all these years with the utmost pleasure and satisfaction.

In justice to American business men, however, it should be stated that most of them are living up to not only the letter but also to the spirit of their contracts here and abroad. And, although we have no desire, of course, to excuse any American business man or bank from the responsibility of carrying out a contract in an honorable way, it must be admitted, in fairness, that there are extenuating, if not wholly justifiable, grounds for some of the repudiations of contracts.

For instance, it is asserted that in numerous cases, when an American importer has purchased sugar in Java, the merchant there postponed shipment as long as possible on a rising market and traded "in and out" to the imminent risk of the American buyer; and very frequently, it is contended, only when forced by a declining market and by the approaching expiration of the letter of credit under the contract has the Java merchant shipped the sugar.

It is also alleged by American importers that, more frequently than occasionally, merchandise purchased abroad has not actually been on board ship within the time specified and that bills of lading have been issued dated back within the life of the credit. Consequently, American merchants feel that they are entitled to reject the goods on a legal technicality, in order to protect themselves against what they regard as commercial bad faith on the part of the shippers.

American importers complain likewise that contracts have been cancelled abroad oftener than here, citing large numbers of such repudiations in South America and in Europe, including Great Britain. They point out that even legislation has been invoked to make the entrance of their goods into port illegal (referring specifically to the rice situation in Cuba).

American bankers can testify that it has become a hazard to make advances on collections drawn on buyers in many foreign countries. As a matter of fact, so great has this hazard become that most bankers in the United States are disposed now to make advances on such collections only in the case of drawers of the strongest financial responsibility. And whatever the foundation for the complaints of foreign banks, we are confident that it is not related to the action of any of the long-established international American banks.

But in this critical readjustment period, it is even more essential than in normal times to preserve the highest business ethics in foreign trade, as well as domestic commerce. Our whole commercial structure rests upon a contractual basis, which, in turn, is founded upon solemn moral obligations. We cannot ever afford to impair the stability of that structure, and certainly not at this time, of all times, by permitting any weakening or deterioration of its very cornerstone.

The man who always retains his head can usually retain a goodly share of other things.—*Forbes Magazine* (N. Y.).

The Metric System and the Lumber Industry in South America

South American countries have been pointed to in recent metric propaganda as enthusiastic users of the metric system of weights and measures.

Nowhere does theory differ more widely from practice. The lumber industry furnishes one of the many instances that can be quoted, as will appear from the following letter received by American Institute of Weights and Measures:

> Permit me to say that I have had considerable personal experience in practically every important Latin-American country, with the exception of Venezuela and Colombia, in work involving the use or purchase of lumber, and with very few exceptions I have not found the metric system to be used to any appreciable extent. It is true that in certain government specifications in certain countries lumber is calculated by the cubic meter, and in other countries they find it convenient to speak of square meters of lumber, which is estimated to be 1-in. thick, but wherever the English measure is not very obviously the one used I have found the tendency to be to use a corresponding Spanish measure of feet and inches, which varies very slightly from the English inch. It is, of course, a matter of considerable annoyance at times to have a divergence in the use of technical terms, but any attempt made to compel people to use the metric system, as regards the lumber industry, would, in my personal and humble opinion, be futile.
>
> I have just returned from a trip to the major portion of all the principal countries of South America and have made it a point to consider this subject in more than an incidental way, and my experience has been such that I would not feel justified in recommending a transfer to the metric system in handling lumber.
>
> (Signed) V. L. HAVENS,
> Editor, *Ingeniería Internacional.*

Aug. 23, 1920.

The lumber interests in the United States are fully aware of this fact. Their position is indicated by the resolutions quoted below as being opposed to the compulsory adoption of the metric system:

New Jersey Lumbermen's Association, Executive Committee, Newark, N. J., Sept. 14, 1920:

> Be it resolved, that the New Jersey Lumbermen's Association is decidedly and unanimously opposed to the adoption of the metric system. It is felt that the adoption of this system would result in endless confusion and great expense, and there is no necessity for a change in our system of weights and measures.

National Retail Lumber Dealers' Association, Board of Directors and Executive Committee, Chicago, Ill., Oct. 22, 1920:

> Absolutely and positively opposed to the proposed metric system, and is in favor of our present system of weights and measures.

Fritz J. Frank Now President of Iron-Age Publishing Co.

Fritz J. Frank, vice-president of the Iron Age Publishing Co., has been elected president of that company, following the resignation of William H. Taylor, who has been president and general manager for more than ten years.

Mr. Taylor has resigned because of ill-health, and has retired from active connection with the Iron Age Publishing Co. He came to the *Iron Age* as general manager, after a group of publishers had acquired the ownership from David Williams. Previously, Mr. Taylor had been connected with various trade and engineering publications over a period of fifteen years, having for a time been vice-president of the McGraw Publishing Co. and, later, president of the Taylor Publishing Co. of Chicago, which consolidated the *Engineer and Steam Engineering.* He and his associates on acquiring the *Iron Age* separated what had long been the hardware department of this journal, and established it as *Hardware Age.*

Fritz J. Frank, who succeeds Mr. Taylor, has been with the Iron Age Publishing Co. since 1910, after an active association with other trade publications, among them *Colliery Engineer* and the *Mining and Scientific Press.* He has a wide acquaintance in the iron and steel and machinery trades, is experienced in business journalism, and is thoroughly committed to the traditions and standards of *Iron Age,* which belongs in that progressive group of business publications which put editorial service to the reader as the basis for substantial and sound publishing development.

McCormick's Plan for Reorganization of U. S. Departments

Reorganization of Government departments is provided in a bill drafted by Senator Medill McCormick of Illinois for introduction in the coming session of Congress. The provisions of the measure have been discussed by Senator McCormick with President-elect Harding, who, according to a statement issued through Senator McCormick's office, expressed great interest in the proposition. The bill will not be pushed until after the new President takes office.

New departments of public works and public welfare are created by the bill. The Interior Department is abolished. All bureaus and functions not germane to the national finance are taken away from the Treasury Department and all duties not connected with the national defense are taken from the War Department. Existing agencies which are scattered irrelevantly through the Government organization are co-ordinated and grouped in related departments.

The bill brings together in the Department of Public Works all important engineering and building services of the Government, and authorizes the secretary of public works to make such changes in the organization of these existing agencies as will increase their efficiency and lead to economy of expenditures. Included in the new Department of Public Works will be the Geological Survey, the Bureau of Mines, the Reclamation Service, the General Land Office, the National Park Service, the Division of Capital Buildings and Grounds, and the Alaskan Engineering Commission, all of which are now in the Department of the Interior; the office of supervising architect, which is now in the Treasury Department; the Bureau of Public Roads and Forest Service, which are now in the Department of Agriculture, the Board of Engineers

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

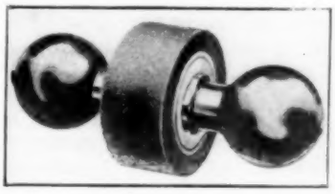
Demagnetizer, "Demagnetool"
William Brewster Co., 30 Church St., New York
"American Machinist," Nov. 4, 1920

It is claimed that this demagnetizer will demagnetize tools to zero instantly and that it is not necessary to rub the tools back and forth on the demagnetizer, but only to put them on and take them off.

Grinding Machine, Disk, Vertical-Spindle, "No. 142"
Badger Tool Co., Beloit, Wis.
"American Machinist," Nov. 4, 1920

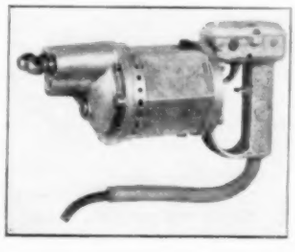
This machine is of the vertical spindle type. The work to be ground is placed on top of the disk and suitable crossbars or stops prevent it from revolving. The spindle is mounted in radial and thrust ball-bearings, the thrust bearing being adjacent to the disk collar. The machine is built in motor-driven type only. Specifications: Disk, 42-in. diameter. Motor, 15 hp. Speed, 600 r.p.m. Complete equipment includes: Steel disk wheel, press for attaching abrasive disks, oil compensator, extra assortment of abrasive disks and an assortment of supplies. Weight 3,000 lb.

Dresser, Grinding-Wheel, "Metcalf"
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," Nov. 4, 1920



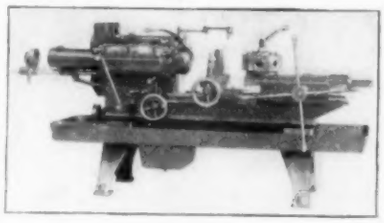
There are three types, "A," "B" and "C." Type "A" is for hand dressing and is shown by the illustration. Type "B" is for use with a toolpost. The dresser consists of a 4 x 1½-in. abrasive wheel revolving freely on its axis. The type "A" wheel is recommended for truing square, round, bevel or V-edges on wheels 1 in. or less in thickness; type "B" for use with cylindrical grinding machines, and type "C" for working in close quarters to true square, round, bevel or V-edges on wheels 1 in. or less in thickness, and the sides on straight or dished wheels.

Drill, Two-Spindle, Electric
Black & Decker Manufacturing Co., Towson Heights, Baltimore, Md.
"American Machinist," Nov. 4, 1920



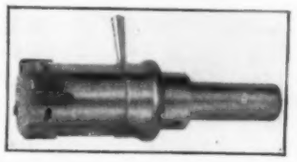
This drill is intended for drilling the holes for automobile curtain fasteners. The handle of the device is like that of an automatic pistol and a pull on the trigger sets both spindles in motion, while a second pull stops them. The motor and the driving gears are said to be simple, yet rugged, the gears being made of heat-treated steel. The two spindles, which are only ⅞ in. from center to center, have special chucks for holding ¼-in. drills.

Lathe, Turret, Geared-Head
Warner & Swasey Co., Cleveland, Ohio
"American Machinist," Nov. 4, 1920



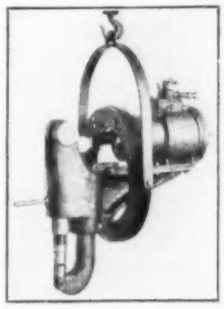
This machine is designed for machining alloy-steel gear blanks, long drilling operations in the solid, and taking heavy facing and forming cuts. Twelve spindle speeds and reverse are obtainable. The No. 4 lathe is equipped with the standard No. 4 cutoff; the No. 6 can be equipped with the regular cutoff or with a "heavy-duty" carriage. There are six power cross-feeds and the turrets can be equipped with power feed having four changes. Specifications—No. 4, maximum capacities: Round bar stock, diameter, 1⅝ in. Length turned, 10 in. Swing over bed, 16 in. Swing over cross-slide, 7 in. No. 6, maximum capacities: Round bar stock, diameter, 2¼ in. Length turned, 12 in. Swing over bed, 20⅜ in. Swing over cross-slide, 9¼ in.

Tap, Collapsible
Rickert-Shafer Co., Erie, Pa.
"American Machinist," Nov. 4, 1920



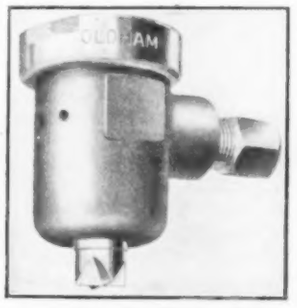
The claims made for this tap are: that the action of withdrawing or collapsing the chasers is positive with no liability to stick; that in tapping to a predetermined depth or close to the bottom of a hole, full reliance may be placed on its action as the chasers will collapse at the proper point; that adjustment for size can be made to fractional thousandths of an inch; that the tap will hold to size within the most exacting limits and that the use of sizing hand taps can be dispensed with. Taps of this type are made in sizes from one to ten inches.

Riveter, Stake for Marine Boiler Flanges
Baird Pneumatic Tool Co., Kansas City, Mo.
"American Machinist," Nov. 4, 1920



This riveter can readily be used in the fabrication of any boiler or tube work where the requirements call for operating equipment having the possibility of adjustment necessary in any of the difficulties met with in such construction. The adjusting screw is of the buttress type and the air cylinders are of the tandem-unit type, both pistons being on the same rod. Specifications: Reach, 5 in. Gap, 12 in. Die adjustment, 3 in. Will drive 1-in. rivets. Air consumption, 4 cu.ft. per drive. Length, 33 in. Height, 40 in. Weight, 750 lb.

Scaling Tool, Valveless
George Oldham Son & Co., Baltimore, Md.
"American Machinist," Nov. 4, 1920



This tool is intended for removing scale from boiler tubes and crown sheets, as well as paint and rust from all metal surfaces. It is claimed that it gives a light rapid blow that removes scale without injury to the surface. It can be fitted with a pipe extension that enables it to reach places which could not be reached otherwise. It measures only 3½ in. overall, weighs 2½ lb., and will operate on any standard air pressure.

Clip, paste on 3 x 5-in. cards and file as desired

for Rivers and Harbors, the Board of Engineers of New York City, the office of Supervisor of the Harbor of New York, the United States Engineers offices, the Mississippi River Commission, the Board of Road Commissioners for Alaska, and the Office of Public Buildings and Grounds, all of which are now in the War Department. The Federal Power Commission is abolished, and its functions transferred to the Department of Public Works.

New departments of Public Works will include the Bureau of War Risk Insurance and the Public Health Service, now in the Treasury Department; the Pension Bureau, and the Office of Indian Affairs, now in the Interior Department; the Women's Bureau of the Department of Labor; the Federal Board for Vocational Education, and other miscellaneous agencies.

The bill abolishes the office of Controller of the Currency and transfers the functions of that office to the Federal Reserve Board. Inasmuch as the Controller of the Currency is ex-officio member of the Federal Reserve Board this action would automatically decrease the membership of the board from seven to six and make the Secretary of the Treasury the single ex-officio member of the board.

The bill enlarges the jurisdiction of the Department of Commerce by transferring to it the Patent Office which is now in the Department of the Interior; the Weather Bureau, which is now in the Department of Agriculture; the Coast Guard, which is now in the Treasury Department; the Lake Survey Office, which is now in the War Department; and the Inland and Coastwise Waterways Service, which is now in the War Department.

The bill creates an additional Assistant Secretary of State who would have jurisdiction over insular affairs. Jurisdiction over territories such as Alaska, now under the Department of Interior, would be transferred to the State Department.

The Alien Property Custodian's office and the Division of Secret Service are placed under the Department of Justice.

The Board of Mediation and Conciliation is abolished and its functions transferred to the Department of Labor. The Council of National Defense is abolished and its functions discontinued. The botanical garden is transferred to the Department of Agriculture.

The reorganization is similar to that which was effected in the State of Illinois by Governor Lowden. Senator McCormick was a member of the Illinois Legislature at the time an investigation was begun looking toward such consolidation and figured prominently in the movement.

Senator McCormick, just before his departure for Europe this week, said the purpose in introducing the bill at the approaching session is to bring about discussion and study, to the end that when Congress acts the best possible scheme will have been worked out.

The Rebirth of French Industry

The French information service of the Bankers Trust Co. of New York has obtained data compiled by the ministry of the liberated regions covering industrial reconstruction progress in the devastated parts of France up to Oct. 1, 1920. The ministry's figures show that the number of damaged or destroyed industrial plants again operating in these regions on that date was more than two and a half times as many as were operating on the same date last year. These establishments comprise more than 76 per cent of the total number of industrial plants in the devastated territory which were damaged or destroyed.

In spite of scarcity of labor due to the loss of man-power in the war, the high cost of materials and the huge task of restoration necessary before productive activity could be resumed, these plants are now employing in actual production nearly half as many men as were employed in all the industrial establishments in the desolated regions in 1914.

The enormous task represented by this progress and its importance, not only to the economic stability of France but of western Europe generally, may be realized, in part, from the fact that the devastated territory in the north where France has made such great strides toward business rehabilitation was before the war the richest industrial section of the country.

Ruin in Productive Regions

The twelve invaded departments, ten of which were left in ruins, produced 63 per cent of France's total steel output, 81 per cent of her textiles, 92 per cent of iron ore and more than 50 per cent of fuel.

France's increasing resumption of industrial activity in the departments in the north which were wasted by war is illustrated by the table showing by three-month periods the progress made in beginning anew the operation of mines, factories, manufacturing plants and other industrial establishments:

	No. of Factories Resumed Work in Whole or in Part	Per Cent of Total Number Damaged or Destroyed
October 1, 1919.....	1,278	30
January 1, 1920.....	1,806	42.5
April 1, 1920.....	2,412	56.9
July 1, 1920.....	3,004	70.8
October 1, 1920.....	3,239	76.4

What the Census Shows

The census of industrial establishments damaged or destroyed as of Oct. 1, 1920, totalled 4,241, employing twenty or more workmen. These concerns employed before the war 773,639 workers. The latest data available from the affected areas shows that on Oct. 1, 1920, 345,664 workers had again taken up productive occupations in industry in these areas. This was 44.6 per cent of the total number employed before the war and more than twice as many as the number employed in production a year ago. The percentage of workmen returned on Oct. 1, 1919, was 20.8 per cent.

In textile manufacture, especially woolen, cotton and linen, France's industrial recovery has made notable progress. This is particularly true of the Lille district including Roubaix and Tourcoing where 409 out of 478 factories damaged or destroyed have wholly or partly resumed manufacture and more than 67 per cent of the prewar number of workers are again employed.

Blast Furnaces Active

Although severely handicapped by lack of coke, the metal and metal working industry is rapidly assuming satisfactory productive capacity. Of fifty blast furnaces damaged or destroyed, thirty-seven have been lighted again; of 844 metal working plants, 736 have resumed production with 50 per cent of their normal force of employees; 62 per cent of the copper and bronze foundries damaged or destroyed are working to full or partial capacity; 51 per cent of the iron foundries and 45 per cent of the nut and bolt factories.

In the chemical industry in the devastated districts 111 out of 142 plants affected by the war are again in operation and 54 per cent of their normal working force is employed. France expects to make even more of her chemical industry now than ever before.

Large installations of hydro-electric power have been made for the conversion of chemical plants which were engaged in explosives manufacture into electro-chemical plants and electro-metallurgical operations. It is expected that French agriculture will benefit considerably from the native production of nitrates which it is hoped will take the place of nitrates hitherto obtained from Chile.

Speeding the Coal Output

Reconstruction of the coal mines of France is being pushed with all possible speed and effectiveness. In the department of Pas de Calais the work is more difficult than in the department of the Nord (these two being the principal coal regions) because the devastation was absolute above and below ground. In spite of this fact, however, the production of coal in Pas de Calais in September this year was 714,292 tons, nearly 100,000 tons more than September a year ago. The total coal production of France for the month of September was 2,419,015 tons as compared with 1,838,000 tons in September, 1919.

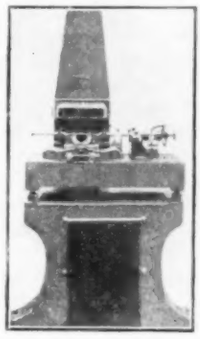
Business Items

The Morse Chain Co., Ithaca, N. Y., manufacturers of the Morse "rocker-joint" silent chain, used on automobiles for power transmission, has established a Detroit branch factory, which will be devoted exclusively to the manufacture of silent chain sprockets and the Morse adjustment. The company will con-

Condensed-Clipping Index of Equipment

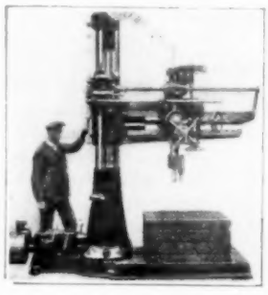
Patented Aug. 20, 1918

Measuring Machine, Gage, Universal, "Wickman"
Alfred Herbert, Ltd., Coventry, England.
"American Machinist" (European Edition), Sept. 4, 1920



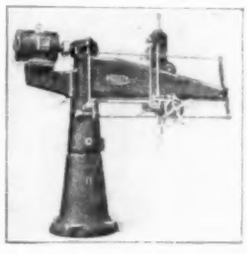
This machine gives comparator readings of diameters and pitches to an accuracy of 0.00001 in., and, it is said, has proved capable of obtaining comparator measurements of length and diameters to an accuracy of 0.000005 in. Magnification is carried out by a combination of mechanical and optical means; a mechanical magnification of 60 to 1 is magnified approximately 70 times by means of light, resulting in a magnification of 4,000 to 1, which eliminates the personal element. Capacity: Length gages up to 12 in.; major, core and effective diameter measurements of screw plug gages up to 6 in. diameter; pitch of screw plug gages up to 4 in. diameter.

Drilling Machines, Radial, Elevating-Arm
William Asquith (1920), Ltd., Halifax, England.
"American Machinist" (European Edition), Sept. 4, 1920



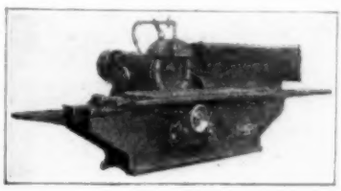
This machine is made in 3 ft. 9 in. and 4 ft. 6 in. radii, with either flat baseplate or self-contained box bed, and 5 ft. radius with flat plate only. The spindle can be started, reversed or stopped at any speed; the self-acting feed motion, through worm and wormwheel, is instantly engaged or disengaged by friction gearing. Fine hand feed motion is provided as well as quick hand adjustment. The auxiliary spindle is driven off the main spindle and runs on ball bearings, enabling the machine to drill both large and small holes at the correct speeds. Either motor or belt drive can be furnished.

Drilling Machine, Radial, Girder
William Asquith (1920), Ltd., Halifax, England
"American Machinist" (European Edition), Sept. 4, 1920



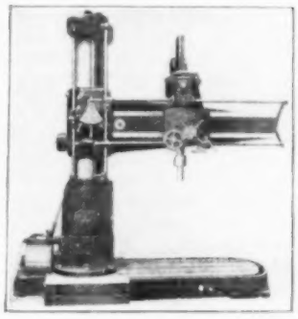
This is said to be practically a "ball bearing" machine, giving easy running and operation. It is made in 6-ft. radius size only. This type can be adapted to various forms of drive, both belt and motor. The spindle is supported on a sleeve, which carries the steel feed-rack, with double ball-thrust washer and ball-bearing journal. A compensating spring balance device is provided for the vertical adjustment of the spindle, and a lever on the saddle starts or stops the spindle instantly. A hand and self-acting traverse to the spindle is embodied in the machine.

Grinding Machine, Surface, Horizontal
Lumsden Machine Co., Ltd., Gateshead, England
"American Machinist" (European Edition), Sept. 4, 1920



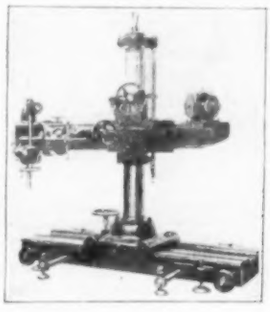
This machine is suitable for general plain surface work, such as flasks, cast-iron covers, hoods, lathe legs, columns, etc. Exceptional mass has been provided to insure rigidity, and the safety of the abrasive mounting has been provided for. The wheel consists of a set of blocks secured by wedges in a housing, from which they project; its diameter is 30 in. The table is 70 x 20 in., with a maximum traverse of 7 ft. The maximum length that can be ground is 72 in., and the height from table to top edge of wheel is 27 in. Feed, 0.0005 to 0.016 in. per reverse of table. Power required, 30 hp. Floor space, 22 x 7 ft. Weight, 5 tons.

Drilling Machine, Radial, Medium Size
William Asquith (1920), Ltd., Halifax, England.
"American Machinist" (European Edition), Sept. 4, 1920



Designed as a high-speed drilling machine of medium size, it drills holes of moderate diameter. The sleeve carrying the arm is rotated on ball and roller bearings. A triple lock lever simultaneously clamps the saddle to the radial arm, the radial arm to the sleeve and the sleeve to the internal pillar. Double ball-thrust washers take the thrust on the spindle to which ball journal bearings are fitted. Either belt or motor drive can be furnished. Sizes, 5 ft., 5 ft. 9 in., 6 ft. 3 in., and 7 ft. radii; and also a heavy-duty machine, in sizes from 5 to 10 ft. radii. For a 1-in. drill the penetration per minute is stated to be 31.3 in. at 500 r.p.m.

Drilling Machine, Radial, Universal, Portable
William Asquith (1920), Ltd., Halifax, England
"American Machinist" (European Edition), Sept. 4, 1920

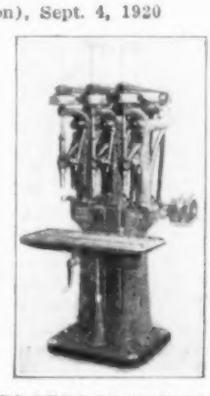


The column of this machine can be locked on the bogie in any position along its base. Adjustable screw jacks lift the machine clear of the floor for working. The radial arm is built in two sections, and hand and power elevating motions are employed. The arm will swing a complete circle and has a tilting motion by hand of 30 deg. The drilling head at the end of the arm will swivel to any angle. The spindle end is bored to standard Morse taper. The motor is 3-hp., self-contained and reversible; three speeds are obtained. Sizes, 4 ft. 9 in., and 5 ft. 9 in.

Grinding Machine, Gage and Form Tool
Lumsden Machine Co., Ltd., Gateshead, England
"American Machinist" (European Edition), Sept. 4, 1920

The bed is of box section, and at its rear carries a sliding horizontal shaft, the free end of which holds the grinding-wheel spindle and the profile follower. The large handwheel is for operating the shaft carrying the grinding wheel, which can be traversed longitudinally 12 in. The horizontal handwheel permits of fine lateral adjustment for the work table, each division in the graduations of the periphery of the handwheel representing a movement of 0.001 in. The total movement of the table thus obtained is 1 in. The work table can be tilted to 20 deg.; it is 27 x 8 in. The grinding wheels are 10 in. in diameter, running at 2,100 r.p.m. The swinging travel of the wheel arm is 4 in.

Drilling Machine, Sensitive, Three-Spindle
F. Pollard & Co., Ltd., Leicester, England
"American Machinist" (European Edition), Sept. 4, 1920



This machine is equipped throughout with ball bearings, and is made with two, four, or six spindles and in a single-spindle bench model. The spindle brackets have a vertical adjustment of 8 in. and are clamped in position by a central locking bolt. The feed levers are adjustable. Each spindle has four speeds, ranging from 385 to 1,092 r.p.m. Diameter of spindles, 1 in.; bored No. 2 Morse taper; vertical movement, 5 in. Distance between spindles, 9 in.; from center to column face, 7½ in.; from spindle end to table face, 25 in. Table, 13 x 31 in. Weight, 1,120 lb.

Clip, paste on 3 x 5-in. cards and file as desired

tinue to manufacture chains and power transmission at the main plant at Ithaca. The Detroit branch will be under the general management of F. C. Thompson, with F. M. Hawley as chief engineer and C. B. Mitchell as factory manager. Sales and engineering offices are located at the Detroit plant, corner of Eighth and Abbott Streets.

The Greist Manufacturing Co., with a plant and main office at New Haven, Conn., has opened a New York sales office at 296 Broadway. This office will handle the company's contract work, consisting of accurate metal stampings, screw machine work and complete assembled machines of light and accurate construction. The office is in charge of A. L. Barrett, recently factory superintendent for the Berger & Carter Co., San Francisco, Cal.

For the purpose of establishing a plant to manufacture electrical batteries of various types, mainly for industrial use, the F. V. L. Smith Battery Co. has been organized and incorporated in Atlanta, Ga., with a capital stock of $300,000. A new plant is to be immediately constructed that will be the first of its kind in the Southeast, and have a daily capacity of 1,000 batteries. A chain of stations will also be established throughout the South.

Obituary

THOMAS W. CLARKE, engineer for the Standard Oil Co. of New Jersey, died suddenly in Tampico, Oct. 28, 1920. Mr. Clarke was born in Roxbury, Mass., Oct. 21, 1872. He received his engineering education in Massachusetts Institute of Technology and was highly experienced in both mechanical and civil engineering. On leaving college he was associated for a time with Manning, Maxwell & Moore. During the Spanish-American War he was an officer in the navy. In 1902 he became associated with the Standard Oil Co. as plant engineer of the Eagle works. In 1905 he was sent to China for the Standard Oil Co. of New York, where he was superintendent of construction and designing engineer in South China. In 1908 he returned to the United States and was assigned to the S. T. Baker Oil Co. to build a compounding and exporting plant for handling the Galena oils. Mr. Clarke later took charge of the construction of domestic trade plants for the Standard Oil Co. of New Jersey throughout the United States and Canada. In 1913 he left the service of the Standard Oil Co. to become vice-president and engineer of the New England Foundation Co. In February, 1920, he again entered the service of the Standard Oil Co., to do special engineering work for the general engineering department of the New Jersey Co. He was assigned to the Cia Transcontinental de Petroleo, S. A., and arrived in Tampico, March 1, 1920.

Personals

EMANUELE MASCHERPA, Via Padova 6, Milan, Italy, whose business was founded in 1903, is an agent for machine tools and accessories for the industry and will accept concessions and agencies or will act as representative of first-class American firms in the machine industry.

WEBSTER TALLMADGE, who has been connected with the Westinghouse Electric and Manufacturing Co., South Philadelphia Works, Lester, Pa., is now manager of the power division, Thomas A. Edison Industries, Orange, N. J.

WALLACE H. MARTIN has resigned as associate professor of mechanical engineering at the Pennsylvania State College and is now professor of heat engineering at the Oregon Agricultural College.

FRANK T. WRIGHT, resident manager of the United States Cast Iron Pipe and Foundry Company, Burlington, N. J., was recently tendered a reception in honor of his leaving to become associated with his brother in the varnish manufacturing business at Schenectady, N. Y. Mr. Wright, who was connected with the Burlington company for eighteen years, was presented with a handsome gold watch. Many of the officials of the company attended the event.

W. B. DUMONT, export sales manager of the Greenfield Tap and Die Corporation, Greenfield, Mass., returned recently from an eight months' business trip to England, France, South American countries and Cuba.

LEWIS E. BELLOWS, president of the Walden-Worcester, Inc., manufacturer of tools, etc., of Worcester, Mass., was elected a member of the executive committee of the Associated Industries of Massachusetts, at the annual meeting held recently at the Copley-Plaza Hotel in Boston.

JOHN C. SPENCE has been appointed works manager of the grinding machine division of the Norton Company, of Worcester, Mass. He has been with the company for a number of years and previous to his new appointment was superintendent of the grinding division.

G. ELLSWORTH BROWNELL has been appointed superintendent of the grinding machinery division of the Norton Co. of Worcester, Mass. Mr. Brownell was formerly assistant superintendent of this division.

GEORGE E. QUIGLEY has recently been appointed in charge of the Detroit territory of the Wickwire-Spencer Steel Corp., of Worcester, Mass., and Buffalo, N. Y. Mr. Quigley's office will be in Detroit.

FREDERICK T. DAVIS is now connected with the New York branch of the Becker Milling Machine Co., Reed-Prentice Co. and Whitcomb-Blaisdell Machine Tool Co., located at Grand Central Palace, New York City. Mr. Davis was formerly with the Davidson Tool and Manufacturing Corporation.

ALBERT H. HOPKINS has resigned from the presidency of the Engineering Advertisers' Association of Chicago, and from the managership of advertising and sales promotion departments of the C. F. Pease Co., Chicago, to become Chicago manager for the J. Roland Kay Co., international advertising agents, at its new building at 161 East Erie St.

C. F. MEYER, assistant secretary of the Landis Machine Co., Waynesboro, Pa., will leave shortly for an extended trip to the Orient in the interests of his company. Mr. Meyer will visit England, India, Dutch East Indies, Australia, Philippine Islands, China, Japan and the Hawaiian Islands.

GEORGE H. MORGAN has been elected treasurer of E. F. Houghton & Co., Philadelphia, manufacturer of oils and leathers. Mr. Morgan will retain the position of managing director of the leather manufacturing department of the company.

Trade Catalogs

Standard Radius Lathe and Planer Tool. R. G. Smith Tool and Manufacturing Co., Newark, N. J. A 3½ x 6 in. catalog, describing and illustrating a standard lathe and planer tool for cutting standard radii accurately and quickly.

Ready Reference Catalog. Ready Tool Co., Bridgeport, Conn. Catalog, pp. 32, 4½ x 6 in. A quick reference catalog, describing its new tools and specialties; prices are also included.

Marine Pumps. Worthington Pump and Machinery Corporation, New York. Catalog BK-3000, 126 pages, 6 x 9 in. A well-bound catalog giving complete data on all kinds of marine pumps and other auxiliaries. Reciprocating and air pumps, air condensers, centrifugal pumps, and other miscellaneous marine products are fully described. Numerous tables and specifications are also included.

Standardized Leather Belting. Graton & Knight Manufacturing Co., Worcester, Mass. Bulletin No 101, ninety-six 5 x 8-in pages. One of the several catalogs issued by this concern, covering the leather industry. This booklet treats of all kinds of leather belting, giving tables, specifications and other useful data on this subject.

Light, Heat, Power. Dwight P. Robinson & Co., New York. Circular of this recently consolidated firm (with Westinghouse, Church, Kerr & Co.) giving summary of work of design and construction of power plants, factories, mills, railroad shops and terminals, hotels and office buildings.

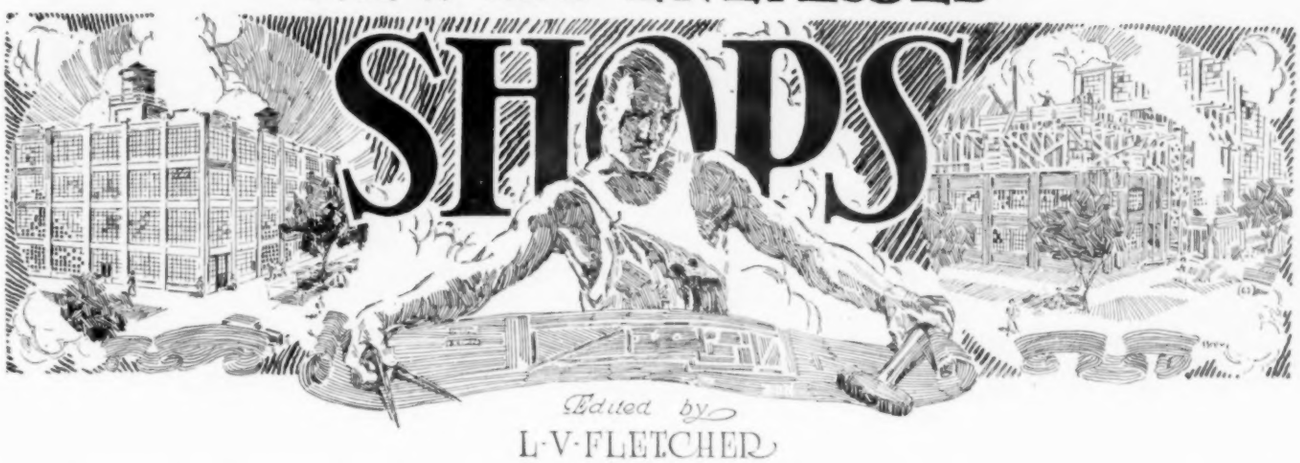
Forthcoming Meetings

The 1920 annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West 39th Street, New York City, from Dec. 7 to Dec. 10.

The American Institute of Weights and Measures will hold its annual meeting at 2.30 p.m. in the United Engineering Societies Building, 29 West 39th St., New York, Dec. 10, 1920.

The Society of Automotive Engineers will hold its annual meeting on Jan. 11 to 13 inclusive at New York.

NEW *and* ENLARGED



Edited by
L·V·FLETCHER

Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

Md., Baltimore—The Metal Package Co., Fells Point, A. E. Bumes, Pres.—$200,000 worth of machinery and equipment for the manufacture of metal boxes and other metal containers.

Md., Baltimore—The Peters Auto Body & Springs Wks., Inc., Ensor and East Sts., H. Peters, Purch. Agt.—small drill press. (used).

N. J., East Orange—Jephson-Scott Body Co., 24 Sterling St.—will soon purchase equipment for new factory.

N. Y., New York (Borough of Manhattan)—The New York Air Brake Co., 40 Wall St.—miscellaneous machine tool equipment.

N. Y., Rochester—The Delco Garage, 98 Manhattan St., R. E. Delco, Purch. Agt.—medium size drill press.

Pa., Easton—Binney & Smith Co.—1 No. 2 Universal milling machine. Prefer Cincinnati, Kempsmith or Brown & Sharpe.

Pa., Philadelphia—The Aircraft Factory, Navy Yard, machine for rolling of threads on wire ends of stay wires for air planes.

S. C., Clio—D. W. Stewart—small machine tools, etc.

Va., Richmond—The Arnold Motor Co., 1325 East Franklin St.—oscillating electric drill which can also be used as a straight drill, a used lathe about 13 in. center and 8 ft. bed, one drill press with 4 speeds.

Ill., Chicago—The Atchison, Topeka & Santa Fe Ry. Co., Ry. Exch. Bldg.—
Six 18 in. x 12 ft. engine lathes, heavy duty type.
One 52 in. heavy duty coach wheel turning lathe.
Three 18 in. x 6 ft. engine lathes.
One 36 in. x 42 in. x 10 ft. slab milling machine. Newton No. 395 or similar.
One 60 in. x 14 ft. engine lathe.
One horizontal slab milling machine, 24 in. x 36 in. x 8 ft.
Four 24 in. heavy duty crank shapers.
One 16 in. heavy duty slotter.
One 36 in. heavy duty radial drill.
Four 53 in. Bullard vertical turret lathes.
Two 16 in. x 6 ft. portable engine lathes.
One double head bolt cutter, capacity up to 2 in.
Three 36 in. heavy duty upright drill presses, Bonner type.
One 36 in. x 36 in. x 12 ft. heavy duty planing machine.
One 250 ton press.
All to be motor drive, 230 volt, d.c.

Ill., Chicago—The Reynolds Electric Co., 2650 West Congress St., C. Ziegler, Purch. Agt.—1 surface grinder.

Mich., Detroit—The Zenith Fdry. Co., Miller Ave.—foundry equipment, etc.

Mich., Port Huron—The Mueller Metals Co., Lapeer Ave. (brassworkers)—No. 3 or 4 Becker vertical millers with rotary tables (used).

Wis., Milwaukee—The Anderson Electric Car Co., 532 Jefferson St.—one screw cutting lathe and one electric drill.

Wis., Milwaukee—The Milwaukee Flush Valve Co., 111 Reservoir Ave., C. W. Wilson, Purch. Agt.—several lathes and drill presses.

Wis., Racine—The Standard Piston Pin Co., 2401 Washington Ave., J. B. Barr, Purch. Agt.—machine tools.

Wis., Wisconsin Rapids—J. Tomsyck—repair machinery, to include lathe, drill press, etc.

Machinery Wanted

Md., Baltimore—The Duraflex Co., 409 Continental Bldg., manufacturers of flooring, etc., J. F. Nachod, Genl. Mgr.—steam jacket kettles with agitator and bottom valve, capacity 100 to 200 gal., set 40 in. above bottom valve.
Paint, grinders and mixers.
Small mixers, Werner & Phleiderer type, bench size to 50 gal.
Dryers, rotary, direct heating type, to dry from 3,500 to 5,000 lb. of asbestos daily.

N. J., Clayton—Le Morrie, Box 345—machinery for manufacturing ivory buttons.

N. Y., New York (Borough of Manhattan)—N. Carbine, 454 West Bway.—one chain pattern log saw.

N. Y., Rochester—The Kelman Electric Co., Main St., E., S. Kelman, Purch. Agt.—buffing machine and buzz saw.

Tenn., Memphis—James C. Graham Wagon Co., 198 Jefferson Ave., A. H. Thoda, Purch. Agt.—machinery and equipment.

Ill., Chicago—The Great Western Laundry, 2125 West Madison St.—laundry equipment.

Ill., Chicago—The Quality Wet Wash Laundry, Normal and 38th Sts.—laundry equipment.

Mich., Calumet—The Calumet Truck Body Co., F. Carlton, Purch. Agt.—sheet metal and woodworking machinery.

O., Columbus—The Hisylvania Coal Co., 8 East Broad St., manufacturers of brick. E. W. Blower, Purch. Agt.—brick manufacturing machinery for Trimble, O., plant.

O., Shelby—The Shelby Hardware Lumber Co., manufacturers of lumber and mill work, R. Skiles, Pres. and Genl. Mgr.—planes, sizer, edger and other wood-working machinery.

Wis., Marshfield—J. and N. Berg—woodworking machinery for their woodworking plant.

Wis., Milwaukee—The Concrete Specialty Mfg. Co., 1904 Fond du Lac Ave.—one wire crimping machine.

Wis., Milwaukee—The Wetzel Furniture Mfg. Co., 1367 Green Bay Ave., L. Wetzel, Purch. Agt.—1 trim saw and 1 drum sander.

Wis., Racine—The Grant Furniture Co., 502 6th St.—woodworking machinery, etc.

Wis., Sawyer—H. H. White Co., manufacturer of toys—woodworking machinery.

Wis., Seymour—The Seymour Woodenware Co., S. A. Konz, Purch. Agt.—circling machine.

Wis., Waupaca—The Stewart Tractor Co., A. Stewart, Purch. Agt.—traveling crane.

Ont., Dungannon—The Riverside Creamery Co.—machinery for its creamery.

Ont., Goderich—The Goderich Mfg. Co., Angelsea St., A. Bacheler, Mgr.—machinery for the manufacture of boxes, egg crates, etc.

Ont., London—Beatty Bros., York St., manufacturers of pumps, washing machines, etc.—machinery for iron and woodworking.

Ont., Ottawa—The city—$25,000 worth of equipment and machinery for stone quarry, including stone crushers, derricks, etc.

S. D., Aberdeen—The Gilbert Mfg. Co., 13 North State St., bolt heading machines to take ⅜ in. to ¾ in. capacity.

Metal Working

NEW ENGLAND

Conn., New Haven—L. D. Felice, 66 Orchard St., will build a 1 story, 44 x 60 ft. garage. Estimated cost, $10,000.

Mass., New Bedford—F. W. Greene, Jr., 252 Union St., plans to construct a 1 story garage on Mill St. and a 1 story garage and repair station on Ash St. LaBrode & Bullard, 251 Union St., Archts.

Mass., New Bedford—The New Bedford Shuttle Co., 24 Elm St., plans to build a 3 story, 60 x 160 ft. manufacturing plant on Rochdale Ave. Leary & Walker, 307 Times Bldg., Engrs.

Mass., Springfield—The Natl. Automobile Parking Co., 145 State St., is having plans prepared for the construction of a 5 or 8 story, 100 x 200 ft. garage, repair shop, etc., on Dwight, East Court and New Sts. Cost between $500,000 and $700,000. O. P. Thompson, Pres. R. B. Warner, 168 Bridge St., Archt. Noted Oct. 7.

Mass., West Springfield (Springfield P. O.)—W. H. Ferguson, 105 Irving St., has awarded the contract for the construction of a 1 story, 40 x 85 ft. garage on Irving St. Estimated cost, $15,000.

Mass., Worcester—H. Edinberg, 22 Brown St., has had plans prepared for the construction of a 1 story, 40 x 80 ft. garage on Pond and Harding Sts. Estimated cost, $15,000. J. P. Kingston, 518 Main St., Archt.

Mass., Worcester—N. Moore, 338 Plantation St., plans to build a 1 story garage on Pond St. Estimated cost, $10,000. E. T. Chapin, State Mutual Bldg., Archt.

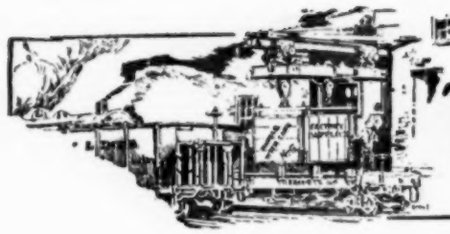
N. H., Keene—A. E. Fish & Co., 8 Elm St., will build a 3 story, 40 x 60 ft. factory, for the manufacture of screens.

R. I., Providence—L. E. Danforth, 76 Dorrance St., will build a 1 story, 110 x 150 ft. garage and show room on Byfield St. Estimated cost, $50,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—W. E. Hooper & Sons Co., 3502 Parkdale Ave., will soon award the contract for the construction of a 2 story, 20 x 34 ft. machine shop. Estimated cost, $25,000. R. P. Hooper, Pres. H. Doeleman, 507 North Charles St., Engr.

(Continued on page 1068p)



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	Current	One Year Ago
No. 2 Southern	$46.50	$30.35
Northern Basic	40.00	27.55
Southern Ohio No. 2	47.00	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	52.40	32.40
Southern No. 2 (Silicon 2.25 to 2.75)	49.16	35.20
BIRMINGHAM		
No. 2 Foundry	42.00	29.25
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	46.00	29.00-30.00
Virginia No. 2	46.25	33.10
Basic	44.00	26.75
Grey Forge	45.50	26.75
CHICAGO		
No. 2 Foundry local	45.00	26.75
No. 2 Foundry, Southern	48.67	28.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	44 00	28.15
Basic	38 00	27.15
Bessemer	42.00	29.35

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.15	$4.30	$3.47	$3.58	$3.37	$3.58	$3.47
Soft steel bars	4.15	4.50	3.37	3.34	3.27	3.48	3.37
Soft steel bar shapes	4.15	4.50	3.37	3.48	3.27	3.48	3.37
Soft steel bands	5.50	6.43	4.07	6.25	.....	.....	.....
Plates, ¼ to 1 in. thick	4.15	4.75	3.67	3.78	3.57	3.78	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.77
Warehouse, New York	4.75	3.37
Warehouse, Cleveland	3.52	3.27
Warehouse, Chicago	4.12	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55-4.50	6.15@7.25	4.57	6.00	6.13
No. 12	3.60-4.55	6.20@7.30	4.62	6.05	6.18
No. 14	3.65-4.60	6.25@7.35	4.67	6.10	6.23
No. 16	3.75-4.70	6.35@7.45	4.77	6.20	6.33
Black					
Nos. 18 and 20	4.20-5.35	7.90@8.80	5.30	7.30	6.90
Nos. 22 and 24	4.25-5.40	7.95@8.85	5.35	7.35	6.95
No. 26	4.30-5.45	8.50@8.90	5.40	7.40	7.00
No. 28	4.35-5.50	8.10@9.00	5.50	7.50	7.10
Galvanized					
No. 10	4.70-6.00	8.65@9.50	5.75	7.75	7.25
No. 12	4.80-6.10	8.75@9.50	5.85	7.83	7.30
No. 14	4.80-6.10	8.75@9.60	5.85	7.85	7.45
Nos. 18 and 20	5.10-6.40	9.00@9.90	6.15	8.15	7.75
Nos. 22 and 24	5.25-6.55	9.15@10.05	6.30	8.30	8.15
No. 26	5.40-6.70	9.30@10.20	6.45	8.45	8.30
No. 28	5.70-7.00	9.60@10.50	6.75	8.75	8.60

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.15	$5.80	$5.50
Flats, square and hexagons, per 100 lb. base	6.65	6.30	6.00

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

NICKEL AND MONEL METAL—Base prices in cents per pound F. O. B. Bayonne, N. J.

Nickel	
Ingot and shot	43
Electrolytic	45

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	42
Ingots	38	Cold rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55
Special Nickel and Alloys			
Malleable nickel ingots			45
Malleable nickel sheet bars			47
Hot rolled rods, Grades "A" and "C" (base)			60
Cold drawn rods, grades "A" and "C" (base)			72
Copper nickel ingots			42
Hot rolled copper nickel rods (base)			52
Manganese nickel hot rolled (base) rods "D"—low manganese			64
Manganese nickel hot rolled (base) rods "D"—high manganese			67

Domestic Welding Material (Swedish Analysis)—Welding wire in 100-lb lots sells as follows, f. o. b. New York: ⅛, 8½c. per lb.; ¼, 8c.; ⅜ to ½, 7½c Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per poundare from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.00
Spring steel (light)	10.00	11.00	12.00
Coppered bessemer rods	9.00	8.00	6.75
Hoop steel	6.00	4.54	5.32
Cold-rolled strip steel	12.50	8.25	10.75
Floor plates	6.40	4.00	6.63

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛ to 3	54-57½%	41½-44%	⅛	15½-25½%	+1½-11½%
			¼	19½-29½%	1½-11½%
			⅜ to 1½	24½-34½%	8-18½%

LAP WELD

2	47-50½%	34½-38%	1½	.....	.....
2½ to 6	50-53½%	37½-41%	1½	.....	.....
7 to 12	47-50½%	33½-37%	2	20½-28½%	6½-14½%
13 to 14	37½-41%	.....	4½ to 6	22½-30½%	9½-17½%
15	35-38½%	.....	2½ to 4	22½-30½%	9½-17½%
			7 to 12	19½-27½%	6½-14½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛ to 1½	52-55½%	39½-43%	⅛ to 1½	24½-34½%	9½-19½%
2 to 3	53-56½%	40½-44%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	45-48½%	33½-37%	1½	.....	.....
2½ to 4	48-51½%	36½-40%	1½	.....	.....
4½ to 6	47-50½%	35½-39%	2	21½-29½%	8½-16½%
7 to 8	43-46½%	29½-33%	2½ to 4	23½-31½%	11½-19½%
9 to 12	38-41½%	24½-28%	4½ to 6	22½-30½%	10½-18½%
			7 to 8	14½-22½%	2½-10½%
			9 to 12	9½-17½%	5½-+2½%

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅛ to 3 in. steel butt welded	38%	22%	39%	30%	54%40%	40½@30 %
2½ to 6 in. steel lap welded	33%	18%	41%	26%	50@40%	37½@27½%

Malleable fittings. Classes B and C, banded, from New York stock sell at plus 45%. Cast iron, standard sizes, plus 5%.

METALS

MISCELLANEOUS METALS—Present and past New York jobbers' quotations in cents per pound, in quantities up to car lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	15.50	18.50	22.50
Tin in 5-ton lots	38.75	44.50	56.50
Lead	6.75	8.50	6.25
Zinc	7.00	8.50	7.60
ST. LOUIS			
Lead	7.25	8.00	6.00
Zinc	6.75	7.70@8.05	7.15

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	23.50	29.50	33.50	26.50@29.00	35.50	36.00	36.50
Copper wire (carload lots)	20.00	20.00	30.75	24.00	30.50	29.00	26.00
Brass sheets	28.50	28.50	32.00	28.00	33.00	27.00	28.00
Brass pipe	28.00	33.00	36.00	30.00	39.00	34.00	37.00
Solder (half and half) (case lots)	29.00	35.00	45.00	29.00	41.00	38.00	38.50

Copper sheets quoted above hot rolled 24 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	25.00	24.00
New York	27.00	28.00@29.75
Cleveland	25.00	29.00
Chicago	30.00	27.00

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound are f.o.b. mill + less 8% for carload lots..... 11.50

	Warehouse			
	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.30	12.50	14.70	13.00
New York	14.00	11.50	14.50	12.50
Chicago	14.50	16.50	14.95	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	7.25	9.50
Chicago	7.25	9.75
Cleveland	8.00	9.75

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	—*New York—			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	12.50	17.00	11.00	11.50
Copper, heavy, and wire	12.00	16.00	10.50	11.00
Copper, light, and bottoms	10.00	14.00	9.50	10.00
Lead, heavy	5.00	4.75	5.00	5.25
Lead, tea	4.00	3.75	3.75	4.00
Brass, heavy	7.00	10.50	7.00	11.25
Brass, light	5.50	7.50	5.00	6.00
No. 1 yellow brass turnings	7.00	10.00	5.50	6.00
Zinc	4.50	5.00	3.50	4.50

*These prices nominal because of dull market

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	$33.00	$30.00	$33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	28.00	32.00
Chicago	29.00	31.00
Cleveland	27.00	35.00

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	70.00	90.00	47.00	70.00	45.00	60.00
Commercial	30.00	50.00	18.00	16.50	11.00	13.00

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York we quote the best two grades, although lower grades may be obtained at from $16 to $20.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	—New York—		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+$1.25	$1.50	List net	$2.25	+1.15	1.85
Hot pressed hexagon	+ 1.25	1.50	List net	2.25	+1.15	1.85
Cold punched hexagon	+ 1.25	1.50	List net	2.25	+1.15	1.30
Cold punched square	+ 1.25	1.50	List net	2.25	+1.15	1.30

Semi-finished nuts, $\frac{7}{8}$ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50–10%
Chicago	40%	50%
Cleveland	50%	55%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+10%	30%	20%
Larger and longer up to 1¼ in. by 30 in.	Net list	30%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..... list Cleveland..... $2.50 Chicago..... $1.90

For cast-iron washers, ¼ and larger, the base price per 100 lb. is as follows:
New York..... $7.00 Cleveland..... $4.50 Chicago..... $5.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	+20%	30%	20%
Larger and longer up to 1 in. by 30 in.	+20%	25%	15%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	20%	10%	10%
Chicago	net	20%	net	20%
New York	30%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	20%	40–5%	30%
Tinned	20%	40–5%	30%

Boiler, ¼, ⅜, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:
New York..... $6.00 Chicago..... $5.73 Pittsburgh..... $4.50

Structural, same sizes:
New York..... $7.10 Chicago..... $5.83 Pittsburgh..... $4.60

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	28.00	33.00	35.00
Brass	27.00	30.00	34.00

The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1 c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities from 10-25 lb., extra is 10c.; less than 10 lb., add .15–20c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $9.85 per 100 lbs.

In Cleveland—$10 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	—— New York ——			
	Current	One Year Ago	Cleveland	Chicago
White	15.00@17.00	13.00	15.00	15.00@17.00
Colored mixed	9.00@14.00	9.00–12.00	11.00	11.00@13.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.00	$2.00	$1.75
Philadelphia	2.75	2.75	1.75
Cleveland	3.00	3.00	2.50
Chicago	2.00	2.75	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.50	$3.90	$3.65
Philadelphia	3.65	3.65	3.87
Chicago	4.10	5.00	4.12½

COKE—The following are prices per net ton at ovens, Connellsville:

	November 22	November 15	November 8
Prompt furnace	$ 8.00@$10.00	$11.50@$12.00	$16.00@$16.50
Prompt foundry	10.00@ 12.00	12.50@ 13.00	17.00@ 18.50

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

	—New York—		—Cleveland—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels, (5 bbl. lots)	$0.95	$2.15	$1.25	$2.50	$1.00	$2.37
5-gal cans	1.10	2.30	1.50	2.75	1.25	2.57
1-gal cans (6 to case)	1.20	....	....	....	....	....

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	14.25	15.75	13.00	14.50	14.25	13.00
25 and 50-lb. kegs	14.50	16.00	13.25	14.75	14.50	13.25
12½-lb. keg	14.75	16.25	13.50	15.00	14.75	13.50
5-lb. cans	17.25	18.75	15.00	16.50	17.25	15.00
1-lb. cans	19.25	20.75	16.00	17.50	19.25	16.00

500 lb. lots less 1% discount. 2000 lb. lots less 10–20½% discount.

(Continued from page 1068m)

Md., Baltimore—The Rice Motor Co., Madison and North Aves., will receive bids about February or March for the construction of a 1 and 2 story, 85 x 175 ft. garage on North Ave and Whitelock St. Smith & May, Calvert Bldg., Archts. Estimated cost, $50,000.

N. Y., Hadley—The Nu Era Paper Co. has awarded the contract for altering and building an addition to its machine shop. Estimated cost, $100,000.

N. Y., New York (Borough of Manhattan)—Kliegl Bros., 240 West 50th St., have awarded the contract for the construction of a 4 story, 60 x 100 ft. factory at 321 West 50th St., for the manufacture of electrical goods. Estimated cost, $65,000.

N. J., East Orange—The Jefferson Scott Body Co., 24 Sterling St., has had plans prepared for the construction of a 2 story, 58 x 63 ft. factory. Estimated cost, $70,000. M. N. Shoemaker, 15 Central Ave., Newark, Archt.

Pa., Meadville—The Phoenix Iron Wks., Mercer and Railroad Sts., has awarded the contract for the construction of a 1 story, 50 x 300 ft. factory and a 5 story, 40 x 100 ft. pattern works extension. Estimated cost, $200,000. Private plans.

Pa., Philadelphia—The Morris Truck & Wheel Co., 75th St. and Island Rd., has awarded the contract for the construction of a wood-working shop and foundry, on 42nd and Woodland Sts. Estimated cost, $23,000.

Pa., Pittsburgh—J. Douglass, c/o Ruton & Russell, Archts., Century Bldg., has awarded the contract for the construction of a 1 story, 30 x 320 ft. addition to garage on Duquesne Way and Sandusky St. Estimated cost, $30,000. Noted Nov. 11.

Pa., West Brownsville—J. R. Herbertson will receive bids until Dec. 9 for the construction of a 2 story, 84 x 123 ft. garage. Estimated cost, $80,000.

SOUTHERN STATES

Fla., Tampa—The O. Daniels Co. will build a plant for the manufacture of forgings and tools.

N. C., Charlotte—C. J. Thies has awarded the contract for the construction of a 2 story, 46 x 146 ft. garage. Estimated cost, $65,000.

N. C., Greensboro—The Carolina Steel & Iron Co. will build the first unit of its plant, to be 110 x 180 ft.

Va., Richmond—C. G. Mercer and R. C. Sutton, 218 North 9th St., is having plans prepared for the construction of a 40 x 50 x 150 ft. garage at 608-610 East Grace St. Estimated cost, $40,000.

Va., Swords Creek—Fire recently destroyed the machine shops of the Kennedy Coal Co.

W. Va., Wheeling—The Wheeling Steel Casting Co., Stop 21, Warwood, plans to rebuild its pattern and machine shop, which was recently destroyed by fire. Loss between $30,000 and $40,000.

MIDDLE WEST

Ill., Chicago—J. T. Ryerson & Son, 16th and Rockwell Sts., have awarded the contract for the construction of a 1 story, 125 x 125 ft. garage. Estimated cost, $100,000.

Ind., Lafayette—The Monon R.R., 508 South Dearborn St., Chicago, Ill., will soon award the contract for the construction of car repair shops, here.

O., Cleveland—H. Dobenspect, 15913 Euclid Ave., has awarded the contract for the construction of a 1 story, 48 x 50 ft. addition to his garage. Estimated cost, $10,000.

O., Cleveland—B. Fenniger, Society for Savings Bldg., plans to build a 2 story garage at 11462 Euclid Ave., estimated cost, $250,000; a 1 story garage on East 79th St. and Woodland Ave., $30,000 and a 1 story garage on Superior Ave. near 33rd St., $50,000. Private plans.

O., Cleveland—The W. S. Tyler Co., Superior Ave., has had plans prepared for the construction of a 4 story, 60 x 260 ft. addition to its factory, for the manufacture of ornamental iron. Estimated cost, $250,000. G. S. Rider & Co., Century Bldg., Archt. and Engr.

O., Painesville—The Lake County Motor Sales Co. is having plans prepared for the construction of a 2 story, 50 x 120 ft. garage on North St. Clair St. Estimated cost, $20,000. F. C. Warrier, Hippodrome Annex Bldg., Cleveland, Archt.

Mich., Detroit—G. W. Graves, Archt., 43 John R. St., will receive bids about Dec. 10, for the construction of a 1 story, 90 x 200 ft. foundry on Miller Ave., for the Zenith Fdry. Co.

Wis., Hartford——The Hartford Tool and Machine Co. plans to build a 2 story, 60 x 150 ft. machine shop on Main St. Estimated cost, $75,000. F. Jordan, Mgr.

Wis., Milwaukee—The International Harvester Co., 606 South Michigan Ave., Chicago, Ill., is having plans prepared for the construction of a 1 story, 50 x 100 ft. garage on Reed St., here. Estimated cost, $20,000.

Wis., Milwaukee—F. Ziesig, 504 Greenfield Ave., is building a 1 story, 35 x 60 ft. garage. Estimated cost, $10,000.

Wis., Redgranite—J. Piechowski will remodel a 2 story, 60 x 120 ft. theatre into a garage.

Wis., Ripon—E. J. Peschke plans to build a 2 story, 40 x 78 ft. and 40 x 50 ft. additions to his garage. Estimated cost, $30,000. J. Kunde, Ripon, Archt.

Wis., Stevens Point—The Farmers Tractor Corp., 80 State St., Oshkosh, plans to build a 4 story tractor factory on Patch St., here. Estimated cost, $150,000. J. Mainland, Pres.

WEST OF THE MISSISSIPPI

Mo., St. Louis—The St. Louis Screw Co., Clarence and Bulwer Aves., is building a plant to cover 45,000 ft. of floor space, for the manufacture of screws, bolts, nuts, bar iron, etc. Estimated cost, $100,000.

CANADA

Ont., Kincardine—The Kincardine Evaporator Co. plans to rebuild its plant which was recently destroyed by fire. Estimated cost, $60,000. W. McRorie, Mgr.

Ont., London—Beatty Bros., York St., manufacturers of pumps, washing machines, etc., are having plans prepared for the construction of a 2 story, 260 x 300 ft. addition to their factory on Chelsea Green. Estimated cost, $200,000. Private plans. Noted Oct. 7.

General Manufacturing

NEW ENGLAND STATES

Conn., Devon—Belpedio & Co., 925 Main St., Bridgeport, plans to construct a 3 story, 60 x 200 ft. plant here, for the manufacture of phonographs. H. E. Koerner, 164 State St., Bridgeport, Archt.

Conn., Waterbury—The Natl. Biscuit Co., 22 Spring St., will soon award the contract for the construction of a 2 story, 50 x 105 ft. addition to its cracker plant on Sperry St. Estimated cost, $35,000. Private plans.

Me., Houlton—P. J. Sullivan, 74 Broad St., Boston, Mass., plans to build a 1 story, 80 x 300 ft. fertilizer plant here. Private plans.

Mass., Cambridge—The Barta Press Co., 28 Oliver St., Boston, is having plans prepared for altering the recently acquired factory on Main St., here, into a printing plant. Monks & Johnson, 99 Chauncey St., Boston, archts. and engrs.

Mass., Cambridge—The E. & R. Co., Massachusetts Ave. and Windsor St., will soon award the contract for the construction of a 1 story dry cleaning plant and laundry. Estimated cost, $20,000. W. A. Dykeman, 120 Tremont St., Boston, Archt.

Mass., Sandwich—The Sagamore Co., 53 State St., Boston, has awarded the contract for the construction of a 1 story pulp mill, etc. Estimated cost, $100,000.

Mass., Shirley—The School Comn., 36 State House, Boston, is having plans prepared for the construction of a 1 and 2 story 35 x 140 ft. laundry and kitchen building at the State Training and Industrial School for Boys, here. Densmore & LeClear, 88 Broad St., Boston, Archts.

R. I., Pawtucket—The Hope Webbing Co., 1005 Main St., plans to build a 5 story, 80 x 198 ft. addition to its factory on Main St. Estimated cost, $300,000. Perry & Whipple, Rhode Island Hospital Trust Bldg., Providence, Engrs.

MIDDLE WEST

Ill., Chicago—The Great Western Laundry, 2125 West Madison St., will receive bids about Dec. 20 for the construction of a 3 story, 95 x 170 ft. steam laundry. Estimated cost, $225,000. A. L. Himelblau, 179 West Washington St., Archt.

Ill., Chicago—The Quality Wet Wash Laundry, Normal and 38th Sts., has awarded the contract for the construction of a 1 story, 50 x 125 ft. laundry. Estimated cost, $20,000.

Ill., Fairfield—The Sexton Mfg. Co., manufacturers of underwear, is having plans prepared for the construction of a 2 story, 100 x 107 ft. factory. Estimated cost, $40,000. W. E. Felix, Archt.

Ind., Columbus—The Indiana Oil Refining Co. plans to build an oil refinery, to have a capacity of 1,000 bbl. Estimated cost, $500,000. O. L. Bartlett, Pres.

Ind., Lafayette—The Chamberlain Ice Cream Co. is having plans prepared for the construction of a 2 story, 60 x 120 ft. ice cream factory on 5th St. Estimated cost, $100,000. Riedel & Zink, Lafayette, Archts.

Ind., Lafayette—The Lafayette Printing Co. is having plans prepared for the construction of a 3 story, 80 x 100 ft. printing plant. Estimated cost, $150,000. Riedel & Zink, Lafayette, Archts.

Ind., Valparaiso—The Pioneer Truck Co. is having plans prepared for the construction of a 1 story, 300 x 600 ft. truck factory. Estimated cost, $500,000. Ronneberg, Pierce & Hauber, 10 South LaSalle St., Chicago, Archts. Noted Sept. 2.

Mich., Detroit—L. Kamper, Archt., 749 Book Bldg., will receive bids until December 8 for the construction of a 3 story sausage factory on Elmwood Ave., for Orling Bros., 522 Elmwood Ave. Estimated cost, $200,000.

Mich., Detroit—Mildner & Eisen, Archts., 924 Hammond Bldg., will receive bids about Dec. 10 for the construction of a 3 story addition to the packing plant of Newton Packing Co., 1041 14th Ave. Estimated cost, $75,000.

O., Youngstown—The Retail Grocers Assn., 1301 Wick Bldg., plans to build a 2 story, 100 x 100 ft. bakery. Estimated cost, $80,000.

Wis., Marshfield—J. and H. Berg are having plans prepared for the construction of a 1 story, 44 x 140 ft. woodworking and blacksmith shop. Estimated cost, $20,000. Private plans.

Wis., Milwaukee—The Polonia Phono graph Co., c/o J. M. Gurda, Archt., 920 2nd Ave., will build a 1 story, 40 x 160 ft. factory on Grove St. Estimated cost, $15,000.

Wis., Milwaukee—A. G. Schultz Co., 417 Clybourn St., manufacturers of paper boxes, has awarded the contract for remodeling a factory on Clinton St. Estimated cost, $25,000.

Wis., Racine—The Grant Furniture Co., 502 6th St., is having plans prepared for the construction of a 3 story, 80 x 120 ft. factory on Washington Ave. Estimated cost, $65,000. D. R. Davis, Schultz Bldg., Archt. and Engr.

WEST OF THE MISSISSIPPI

Ia., Centerville—The Albia Packing Co. had plans prepared for the construction of a packing plant. Estimated cost, $125,000. C. W. Monroe, Pres.

Ia., Fort Madison—The Hinde & Dauche Co. plans to build a paper mill. Estimated cost, $100,000.

CANADA

Ont., Dungannon—The Riverside Creamery Co. plans to build a creamery to replace the one which was completely destroyed by fire. Estimated loss, $60,000.

Ont., Goderich—The Goderich Mfg. Co., Angelsea St., plans to build a factory for the manufacture of boxes, egg crates, etc. Estimated cost, $80,000. A. Bacheler, Mgr.

Que., St. Lamberts—C. F. Moore, Ltd., plans to build a sash and blind factory. Estimated cost, $25,000.

FOREIGN

Cuba, Havana—M. Diaz is having plans prepared for the construction of a bottling plant. Estimated cost, $1,000,000. Ophuls, Hill & McCreery, 112 West 42nd St., New York City, Archts. and Engrs.